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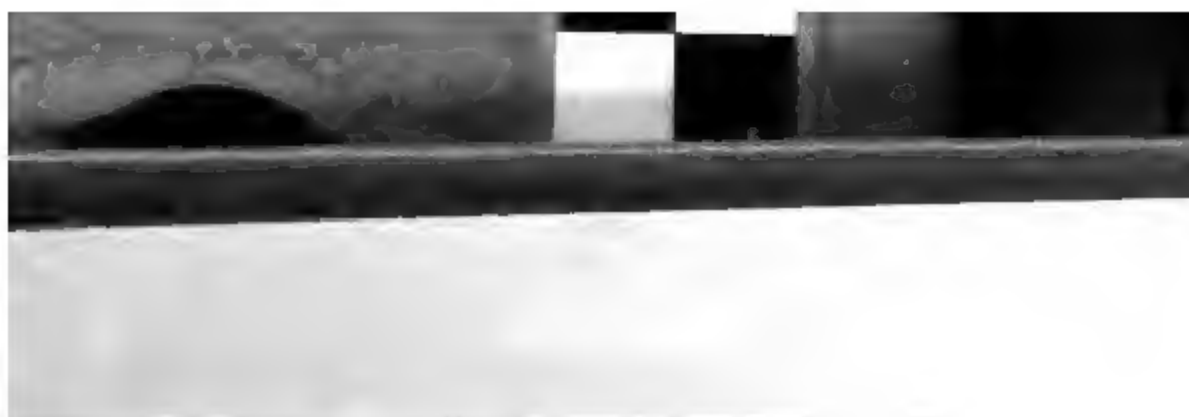
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PSYCHOLOGY

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- The War and America**
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PSYCHOLOGY

GENERAL AND APPLIED

BY
HUGO MÜNSTERBERG



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To
HERBERT SIDNEY LANGFELD.



PREFACE

It can hardly be claimed that a new textbook of psychology is needed because there is lack of old ones. On the contrary, we have a bewildering variety, and America has contributed a large and brilliant share. Yet the plan and aim of the present book are very different from all of them.

One difference is indicated even by its sub-title; it includes the applied psychology as well as the general. Hitherto the textbooks have been confined to the theoretical study. The time seems ripe for bringing the psychological work into full contact with the practical efforts of civilization. The application of psychological studies to education and law, to industry and commerce, to health and hygiene, to art and science, deserves its place in the psychological curriculum. Thus the last third of this book may be a supplement to any other textbook.

But the book adds to the usual material still another essential part. The psychology of our textbooks is individual psychology; this volume also includes the social psychology. The processes which result from the social contact have traditionally been neglected, because individual psychology had to reach a certain completeness before the scientific interest could turn to social consciousness. But our day, which has seen the ripening of applied psychology, has brought us also the rapid growth of social psychology, and its outlines ought to be drawn in any map of the psychological world.

Finally, the traditional psychology is confined to descriptions and explanations. Very justly, such an explanatory account of mental life omits an entirely different

aspect, its inner meaning. But this meaning of the acts of our mind offers, after all, problems of its own. They must be solved; we cannot simply ignore them. This book, therefore, traces them in a special part, called **Purposive Psychology**. Our causal psychology is and must be a psychology without a soul; the purposive psychology culminates in the understanding of the soul and its freedom.

While the addition of an applied, a social and a purposive part makes the material of this book very different from the others, its method, too, deviates in many respects from the customary procedure. I may mention one negative feature: it is not concerned with the structure of the brain and of the sense organs. A book which sketches the outlines of psychology cannot include the details of accessory sciences like the anatomy of the nervous system. In a college course the instructor may easily add such information and show pictures and models.

On the other hand, the book emphasizes the principles, both the biological-physiological and the philosophical. Those who dislike to touch philosophical problems in psychology can easily omit the chapters on the principles of causal psychology and again those on purposive psychology. Yet it is hardly wise to encourage this aversion for the wider aspects. Do we not deceive ourselves if we fancy that we can approach the study of mental states with the same naïveté with which we can turn to the study of minerals and plants?

HUGO MÜNSTERBERG.

Harvard University, May, 1914.

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PSYCHOLOGY

INTRODUCTION. THE AIMS OF PSYCHOLOGY

CHAPTER I

THE INTEREST IN PSYCHOLOGY

Naïve Interest in Psychology.—Long before we turned to any scientific psychology, we all were interested in the traits of mental life. To be sure, we watched our material surroundings and were captivated by the happenings of outer nature, before we became aware of the processes in our inner life. But, after all, everybody noticed early whether his memory worked well or badly, how his attention sometimes failed him, how he was able or unable to think out a problem, how fear or hope, and joy or anger, arose in him. He may have been startled by the wonders of his dreams or by the play of his imagination; he may have thought about the limits of his personal talents or about the special gifts of his mind; he may have felt conflicts between his resolutions and his will. In short, the naïve curiosity which turned first to toys and tools, to stones and plants, later turned to memory ideas and fancies of the imagination, to feelings and excitements, to acts of desire and of volition, to talent and intelligence. They cannot be found without: the attention must turn inward to observe them. But at the same time we knew and

watched the inner life of the other people around us. We became aware of the varied behavior of men and followed their expression, we tried to understand their peculiar ways and became interested in the display of emotions of those with whom we were in contact. This interest in the behavior of other beings extends to dog and horse and bird.

All such naïve observing of our own mental life and of that of our friends satisfies the natural desire for knowledge, even if the knowledge is not useful for any practical ends. Yet the practical life drives us steadily toward such observation, too. We do not want merely to take notice of the curious fact that something which we did remember has slipped from our memory, or that the solution of a problem suddenly rushes to our mind, or that our attention wanders away during a lecture, or that our liking was stronger than our will. We want to understand still more how much we can trust our memory and our attention and our will, and how we can train our mind or how we can suppress an unwelcome emotion. Above all, we want to look into our neighbor's mind for our practical purposes. How will he behave? His friendliness or his unkindness, his carefulness or his negligence, his good or his bad memory, his humor or his character, may be matters of deep concern to us. We try to foresee how another's mind will work just as we try to foresee how the physical instruments and the chemical substances will help or hinder us.

At first all this remains unconnected, and does not shape itself into any general idea of mind and mind's action. But it easily leads further from mere curiosity to an earnest interest. The haphazard knowledge of human behavior becomes broader, we notice regularities which occur in our mental life, we get a clearer insight into its limitations, and we may be led to a common sense theory about the nature of that inner being. We begin to think about the relation of the mind to the body, of freedom and re-

onsibility, of the inheritance of mental qualities, of the life of the mind after death. In the same way our observation of mental life in the interest of practical purposes comes deeper and wider. The manifold purposes of civilization demand this from us. We cannot bring up children or teach them in classrooms without carefully watching their mental qualities and without trying to foresee how their minds will work in new situations. We cannot deal with criminals in the courtroom without trying to analyze the motives which impel them. Nor can we be in politics without thinking about the ideas and impulses, the character and the abilities of the public men. We cannot, if interested in industrial problems and social questions without giving attention to the mind of the workingman, his fatigue and to his feelings, to the strain on his attention and to the satisfaction of his desires.

Theoretical interest and practical demands alike lead us this way at first to a naïve, and then to a deliberate, watching of mental life, and by this to the gate of psychology. We need only to make the observation more uninstaking and careful, more extended and systematic, and we are in the midst of psychology. Of course as soon as we aim toward such deliberate study of the mind, we all apply more reliable methods than a mere occasional watching of events in our inner life or in the behavior of our neighbors. The botanist, when he examines the plants, is no longer satisfied with the way in which the friendly nature strolls through the woods and the meadows, picking the flowers which he likes along the path; he seeks definite kinds of plants, dissects them and studies them under his microscope. The psychologist, too, will make himself independent of mere chance, will collect his data from the widest fields of human experience, will produce mental processes at will in order to examine them, will provoke all kinds of mental behavior in man and animal, will compare the mental characteristics in adult and child, in

man and woman, in normal and diseased persons, in different races and under different conditions of life. He will repeat and repeat his observations, will disentangle the complex inner states and will seek the elements from which they are composed, and he, too, will use subtle instruments and carefully adjusted apparatus to discover the real facts. But with all this refinement of method and with the expansion of the outlook, the original interest does not change its character, but only its strength and seriousness.

Scientific Interest in Psychology.—The motives which may lead us to the systematic study of psychology are as manifold as the naïve interests. First of all, we want to understand the working of the mind, the laws which control its processes, the conditions under which it works, the effects which it produces; we want to understand the inner ties between our mental states, their meaning, the elements which enter into them. This theoretical science will branch out into special sciences which deal with child psychology or pathological psychology or animal psychology or the psychology of individual differences. Moreover the study cannot be confined to single individuals. Their mental life is combined in social action. If we are to understand mental life, we must follow up the working together of human minds from the simplest contact in a friendly talk to the firmest connections in a life of mutual devotion, from the narrowest circle of the family to the widest circle of the civilized nations. The behavior of the social group and the laws of the social mind and the meaning of the social impulses thus fall no less into the compass of psychological interest.

But, as on the level of simple commonsense, so now on the higher level of science, we cannot remain merely theoretical. The practical demands take control of our endeavors. This is not meant in a trivial sense of mere selfish usefulness. Those practical motives with which we may approach the study of psychology are of service to

the highest tasks of cultured society. The aims of education and justice, of health and social reform, of industrial enterprise and esthetic achievement, make it daily more necessary to understand the mental factor which enters into the social practice. The engineer must recognize that the mind of the workingman is no less important for the final industrial outcome than the machines. The lawyer cannot confine his interest to the legal problem; he must understand the working of the minds of all who figure in the court, the defendant and the plaintiff, the witness and the jury. The teacher of our modern days knows that an understanding of the mind of the pupils is worthy of the same scholarly effort which is devoted to the content of instruction. The physician is aware that his drugs and his remedies must be supplemented by carefully adjusted influences on the mind of the patient.

The application of psychological knowledge, however, may not be limited to the practical tasks to be fulfilled. We may apply psychology for the understanding of the life around us and of the life which has passed away. With the interest of the historian we may try to analyze the psychological processes of the events of earlier times. The personalities of the heroes and the movements of the masses, the leaders in politics and in war, in religion and in art and in every unfolding of civilization may be brought nearer to our understanding by the application of psychology. The great wars and revolutions, the growth of nations and their decay, the development of religions and arts, the changes in the language and customs, all may be explained with the help of psychological knowledge.

We desire to know and to understand the working of the mind with the theoretical interest with which we study the stones and the stars. We feel the practical interest which makes us master the mental reality to use it as a tool for the purposes of civilization. Yet these are not the only motives for such a study. The interests which

lead toward the pursuit of scholarly psychology may arise from a still deeper source. We want to understand the problems of inner life and of human behavior, because we feel, at first vaguely, that they are intimately connected with the ultimate questions of our life reality. To understand the science of our mind then no longer means to acquire some little specialistic knowledge, as if we were to learn a chance chapter of natural science or history, but it means insight into the last meaning of our total existence: what are we, and whence do we come? Is our will free in its decisions, or is it dependent upon the actions of the brain? Is our mind really controlling our body, or are our mental processes only accompanying the currents in the nervous system? And such questions lead at once to those of freedom and responsibility, and further on to the deepest problems of duty and morality, and ultimately of religion. Or again we may turn to psychology under the pressure of other philosophical doubts. We seek truth and beauty and morality in the belief that these ideals have a lasting value of their own; must not our loyal belief be undermined by the understanding that such thoughts of ideals are merely processes in individual minds, and thus dependent upon the psychological laws? How can these ideals be valid for us personally, how can they be binding for mankind, if they are nothing but the passing states of our mind, like memories and dreams? The deepest concerns of our soul are here involved.

CHAPTER II

THE REALM OF PSYCHOLOGY

The Definitions of Psychology.—We have discussed the reasons why men may turn to psychology, but we have not as yet stated what psychology really is. We have gone on without any exact definition; we have so far left everything in the vague and indefinite form in which common-sense takes hold of it. We have spoken of inner life or of mental states or of human behavior, of observing our inner experience, of understanding personalities, of describing and explaining the processes of the mind, and we have used some other similarly general terms without even asking whether they characterize correctly the aims of the psychologist. We might just as well have spoken of the soul or of consciousness, or, to use the more scholarly term, of psychical phenomena. No one of such phrases was proposed as a definition to mark out clearly the work which the student of psychology has to take up.

Usually textbooks of psychology begin with a precise definition. We have abstained from that, because there is some danger involved in such a starting point. All astronomers agree as to what astronomy can be and ought to be; but the psychologists disagree as to the aims of psychology. Only where a consensus of opinion exists can it be right to begin at once with a definite statement of what the particular science is called to undertake. Where different views are possible we have hardly a right to go to the work with a more or less arbitrary decision that one defini-

tion and not another is to be accepted. To discover what psychology really is, ought to be the goal of a penetrating inquiry. Various possibilities ought to be considered. The neglect of this demand has too often led to a regrettable one-sidedness. It may even be that the inner life demands different kinds of scientific treatment, which may be equally justified and which may equally fall into the compass of that which the vagueness of commonsense would call psychology. Then we should have no right to say that, because one kind of psychology is valuable, therefore no other exists. There may be two or more standpoints possible in psychology, and a general definition ought to be wide enough to include them. Yes, it may be said that *to reach a clear understanding as to the true meaning of psychology is a more difficult task than the solution of any special psychological problem.* And it must be frankly confessed that, while modern psychology has made rapid progress in the mastery of the special facts, it has progressed only slowly toward this fundamental problem of psychology, what its aim ought to be.

This may seem to some a slow way of approach. They are anxious to come to the actual facts of mental life and to study the realities of conscious experience instead of entering into cumbersome discussions about the principles and underlying purposes of psychology. They do not want abstract theories, which seem to them a wrangling about words, but are longing for a knowledge of concrete processes and their laws. But such a desire for a hasty approach to the details is ill advised; its hope is illusory. The uncritical rush toward the mental states cannot bring us nearer to them. We must know first what kind of facts belong to our study, and what way of approach is demanded by it. And if we do not settle these preliminary questions patiently, we cannot wonder if later we find confusion among the so-called facts.

The objects of psychology cannot be collected like flow-

ers, which we pick, and butterflies, which we catch, and which we can bring home and show to others. Memory ideas and imaginative acts, feelings and emotions, volitions and judgments are not facts which can be picked or caught. And if we speak of them, describe them to others, and make their meaning clear, or explain them, we must have somehow settled for ourselves those problems of theory. *We cannot take hold of any mental facts without seeing them through some kind of a theory*, and, if we really aim toward a consistent view of mental life, we have no right to be satisfied with the superficialities of commonsense or with the dogmatic statements of an arbitrary definition: we must really examine what it means to speak of psychological facts, and how psychology is to approach them.

As to certain aims, to be sure, all psychologists agree. Here, above all, belongs their decision to abstain from any judgment of value. If the psychologist approaches mental life, he has *no interest in asking whether the mental states are valuable or not*. He does not care whether the will impulses in the mind are good or bad, moral or immoral, whether the imaginings of the mind are beautiful or ugly, whether the thoughts in the mind are wise or foolish, whether the emotions of the mind are holy or sinful. The dissecting botanist is interested in the ugliest weed as much as in the beautiful flower, the chemist cares for the constitution of the deadly poison as much as for that of the helpful drug. In the same way the psychologist is surely interested in the analysis of the criminal act as much as in that of the heroic deed, in the babbling of the insane mind as much as in the reasoning of the thinker, in the silliest play of the infant as much as in the highest creative processes of the artistic mind. He remains the neutral observer who understands and explains the mental events without forming a judgment on them. As soon as he begins to evaluate them he oversteps the boundaries of his

realm and is trespassing on the fields of logic, ethics and esthetics.

But so long as we only agree that the value aspect of mental life is not accessible to the psychologist, we have not settled anything as to his material. We may begin here, too, with a negative claim: *the psychologist is not concerned with the outer physical objects*. The processes and laws of bodies as such are never the material for a psychological study. Yet with this we are already approaching debatable ground. Some might doubt the correctness of this sweeping statement, and limit it to the inorganic world and the vegetable kingdom. They would say that, if we approach the bodies of the animals and above all the bodies of the human organisms, we have a part of the physical world before us which is of greatest importance for the psychologist. But there is no real contradiction. Nobody can doubt that the mental life which the psychologist studies is most intimately connected with the functions of the body, of the nervous system, of the brain. But while it is so firmly connected, and while the body and its functions are thus indeed of deepest import for the psychologist, the body is not itself the real object of his study. The growth of the flowers is intimately dependent upon the soil and the water and the light, and yet water and light and soil are not the objects of the botanist's study. The mental life may be dependent upon the nervous system and the brain, but it does not consist of such physical processes.

The Two Standpoints in Psychology.—The elements which we have gathered so far in order to define the aims of psychology are two. We have said that the psychologist is interested only in the inner experiences as against the outer physical world, and that he has to do with them in a theoretical way, abstaining from all judgments of value, from all liking and disliking, praising and blaming. But this is certainly still insufficient for a positive

account of his actual work, because the chief question remains: what is inner experience, what is our inner personal life? The difficulty lies in the fact that we can take account of ourselves in several ways and the inner experience may thus appear as something very different, from different standpoints. The frequent failure to discriminate them is more than anything else responsible for the confusion and the shortcomings in the field of psychology. We can take two fundamental attitudes toward the inner experience, and both are important and significant; we have no right to prefer the one to the exclusion of the other, or, worst of all, to mix the two in a haphazard way. Those two attitudes do not start with scholarly psychology. They prevail in our ordinary life and are intertwined in our daily intercourse. We may perhaps suggest the difference at first in saying that *we can try to explain mental life* and that *we can try to understand mental life*.

If someone asks us a question, our aim is to understand what he has in mind. We try to enter into his thought and to understand his feeling about it, in order to take an attitude toward the question in answering yes or no. If we succeed, we feel sure that we have grasped everything which is in the questioner's mind. His whole inner experience has become clear to us and is completely understood. Yet exactly the same mental process of the questioner might awake in us an entirely different interest. Instead of considering the meaning, we might ask ourselves what causes these thoughts and feelings. How did those ideas enter the mind? Are they perhaps effects of some earlier experience? How do those questions arise in consciousness, and from what elements are they composed? Then we look on the other man's mind as a kind of mental mechanism, made up of a variety of mental states, the appearance and disappearance of which demand some kind of explanation. We may even explain them by brain

processes of which the questioner himself does not know anything, or by after-effects of earlier impressions which he may have forgotten.

These two standpoints present themselves in every bit of experience. If a man commits a crime, we may be interested in understanding the motives and aims in his mind, and, if we are to judge his deed, we certainly must try to think ourselves into his mind, in order to understand his action from the inside. His emotions and his volition, his crime, everything is to be understood as the expression of his personality. Only through this do we enter into his self. Yet we might study the same criminal from an entirely different point of view; we might ask ourselves from what causes this criminal deed arose in this man. How far are his education, his life habits, his surroundings, his state of health responsible for the development of these impulses? How far did the fatigue of his brain, or the influence of alcohol, or a disease produce the abnormal impulse? What causes interfered with the mental resistance of his will? From what source did the ideas or the memories and the hopes or fears arise, and how did they come to result in that criminal deed?

In the most trivial conversations or in the most momentous situations of life the mind with which we are dealing may in this way be to us *either a self into whose purposes we enter, or a bundle of mental states which are linked together*. In the same act of experience we may change between the two standpoints. The crying child may awaken our sympathy, and we naturally try to understand his pain, or his sorrow. But at the next moment we think how to distract his attention, that is, we think how to cause in his mind a new process by which the displeasure will become inhibited. To do this the child's mind must be looked on as a set of connected processes in which the effects which will result can be determined beforehand.

Yet this twofold way of looking into the neighbor's

mind shows itself no less when we think of our own mental life. We go through the world and mingle among men, each one always feeling himself as an individual personality whose feelings and ideas are his real self. Our love and hate, our likes and dislikes, our agreeing and disagreeing, our thinking of this and of that, are the acts which stand for our personal life. We live in those feelings and emotions and thoughts; we ourselves are those inner activities. And yet we may consider this same inner life as if we were spectators looking on at that procession of inner events, observing the happenings in our own consciousness. Then we give our attention to the structure of our memories and imaginative ideas, perceptions and thoughts, and even our feelings and emotions and volitions then lie before us like objects of which we become aware. Anyone who begins self observation is forced to take just such an attitude toward his inner life. He watches himself, looks out for every bit of sensation, of feeling, which he finds in his mind, in order to describe them, and if possible to explain them. A greater contrast can hardly be imagined: on the one side the stream of life in which our will and feeling and thought are to us meaning and expression of our self, and on the other side the neutral taking account of the processes in our mind as if they were a spectacle which we are objectively watching.

Surely the first standpoint is the more natural one. If you and I talk with each other, I do not only take you as such a subject whom I am to understand, but I feel myself as a subject who agrees and disagrees, who likes and dislikes what you say, and who wants his own opinion to be understood. It is quite improbable that I have reasons to watch my mental states as objects, while we are engaged in our conversation. But if I afterward begin to think about it, I may very well call back those ideas and emotions of mine and make them pass before my inner eye as mere mental happenings which come and go like the clouds

and the sunshine and the landscape outside, and I may analyze them and observe their elements, their structure, their connections and their effects. It is a somewhat artificial method: it is artificial like all analysis and dissection. It is more natural to drink the water than to analyze it in the laboratory into its chemical elements. But if we want to understand what we can expect from the water, we must determine its constitution and examine its properties. It is indeed a kind of scientific, naturalistic attitude toward our inner life, when we begin to treat it like a series of objects. But as soon as we want to foresee what effects are to be expected and what causes are at work and how the parts hang together, we cannot help choosing this artificial standpoint.

Demand for Consistency.—The psychologist has no right to indulge in any mixing of the two modes of approach. No doubt, it is always easier to be inconsistent, and the temptation to such inconsistency is great here. As long as the psychologist gives account of the perceptions and the memories, the colors and the tones, the smells and the noises, it appears so much more convenient to describe them as various contents in the mind and to analyze them and then to turn to their explanation. On the other hand, if he has to give account of feelings and volitions and emotions, of character and temperament and judgment, it seems so much easier to take the other standpoint and to speak of their meaning and to interpret their purposes. But if we do so we can never reach a consistent and unified account of mental life, and that must after all remain the goal which the psychologist cannot give up. As long as he is to describe and to explain, he cannot acknowledge that there is anything in the mind which does not allow such description and explanation. He must feel like the naturalist, who takes it for granted that everything in the universe is subordinated to natural laws. Correspondingly, if we are to interpret mental life and to understand it

n its meaning, then we must do justice to such a demand for every function of our mind. Our own personal life and that of our friends and our foes then comes in question only as an expression of meaning, and everything has to be looked on from that point of view.

In medieval times the astronomers tried to explain some movements of the stars by their natural laws, and some by the fact that the angels were moving the stars. We know to-day that no consistent view of the universe can be gained, if we mix two such different accounts. Either we interpret the processes of nature religiously as an expression of God and his angels, or we explain them through causal laws. Either viewpoint will yield us a unified aspect of the world, but we have no right to combine the laws and the angels in one scientific picture. The psychologist who makes us understand inner life by interpreting the meaning and following up the inner purposes, gives us indeed a perfectly unified view of man's mind; and so does the other psychologist who treats mental life as a mechanism which is to be described and to be explained as a causal system. In other words, we must acknowledge a true psychology as complete only if it allows room for two different aspects of personal experience, each of which must be consistently carried through. Both kinds of psychology are justified, if they are carried through with this consistency. To recognize the difference means to do justice to both sides. Life needs both; science cannot ignore them. A complete psychology must deal with the whole mental life as a system of mental processes to be explained, and must deal in another part with the whole mental life as an expression of personality to be understood in its meaning. The two parts must supplement each other.

Causal and Purposive Psychology.—It means very little what name we give to the two aspects of psychical experience, but it means extremely much to keep them cleanly separated and to recognize distinctly the principles which

control them. We might call the one aspect objective and the other subjective. Sometimes the first has also been called a psychology of mental states and the other a psychology of the self. Again a quite characteristic choice of titles is to call the first the psychology of the content of consciousness and the other the psychology of meaning. We might also speak of explanatory psychology as against interpretative psychology. Yet we prefer the designation which points most directly to the deepest character of the contrast, and shall call the one *the causal psychology*, the other *the purposive psychology*.

To understand mental life as a system of causes and effects is indeed the most significant aim of the one kind of study; and to understand it in its meanings, and that is, in its purpose, is the fundamental condition for the other kind. Everything else, the special principles and the special methods and the special conceptions, follows from this parting of the ways. Every further discussion ought therefore to refer to the one aspect or to the other. Hence our introduction to the total study of psychology has here reached its end, because from now on we must separate the two groups of inquiries, until they finally reach a point where they come together again. That meeting point is reached in applied psychology which speaks of the practical application of mental facts in the service of our human purposes. The selection of those purposes is a matter of purposive psychology, the mental effects to be used a matter of causal psychology. They are thus joined in that practical part which comes nearest to real life. But, until we reach it, we must be loyal to the chosen one-sidedness with which we follow mental life at first only on the one, and then only on the other side.

The programme for this book is thus clear and evident. We shall speak first of the causal aspect of the mental life, then of the purposive aspect and finally of the practical aspect. Both in the causal and in the purposive

psychology we shall discuss first the general principles and methods, then the individual processes, and finally the social processes. It is necessary indeed to keep this plan constantly before our mind. Then only every detail can be understood in its right proportion. Otherwise it would be necessary to put before every paragraph of the causal psychology a danger signal which would warn the student not to take this account as the whole truth, but to remember that the purposive aspect of the same mental act is no less true and no less significant. But we trust that this is not needed. We shall resolve the personality into the elementary bits of psychical atoms and shall bring every will act into a closed system of causes and effects. But in the purposive part we shall show with the same consistency the true inner unity of the self and the ultimate freedom of the responsible personality. *Those two accounts do not exclude each other*; they supplement each other, they support each other, they demand each other. The last part of the purposive psychology will bring us to a height from which this inner harmony of the two aspects becomes clear. Then every feeling of contradiction will disappear, and we shall be forced to see that causality and freedom, complexity and unity, natural laws and ideals do not interfere with one another, but can be combined in an ultimate view of pulsating reality.

One of the household instruments of our psychological laboratories is the well-known stereoscope, into which two flat pictures of a landscape are put. The left eye sees an ordinary photograph of a landscape from the left, the right eye the same landscape taken from the right, and either gives the incomplete impression of a flat surface. But as soon as both pictures are seen with the two eyes together, the two one-sided, flat impressions disappear and instead of them one lifelike vista of the scene is perceived with its depth and plastic fullness. We too have to draw at first the one, and then the other picture of man's ex-

perience, each taken from a special standpoint, each remaining one-sided, flat and lifeless. But we shall see, if both are grasped together and combined in a higher unity of understanding, that they blend into one plastic view of personality, with the true depth and fullness of real life.

BOOK I. CAUSAL PSYCHOLOGY

PART I. PRINCIPLES OF CAUSAL PSYCHOLOGY

CHAPTER III

PSYCHOLOGICAL EXPLANATION

Psychological Laws.—The aim of the causal psychologist is the explanation of the mental processes. How is true explanation possible? The physicist who seeks explanations for the occurrences in nature tries to find the processes which regularly precede other processes in experience. From the regularities which he observes he develops the physical laws and reaches through that the first stage of explanation. He knows the law that, if an electric current is closed, a certain magnetic phenomenon happens, and, if the electric current is broken, the magnetic phenomenon stops. The law allows it to be determined beforehand whether the magnetic power of the iron will appear or not. There seems to be no difficulty for the psychologist in observing such regularities also among the processes of the mind. We notice often that after one process in consciousness another process occurs. The taste of candy brings with it a certain feeling of pleasure; the taste of cod liver oil brings just as regularly a feeling of displeasure. Moreover the feeling of pleasure, as soon as it has become a process in consciousness, awakes another process, namely the will to keep that sensation. The unpleasant feeling stirs up the will to get rid of the impression. Such regular connections can be found a thousand times in our daily life, and, if we are interested in

watching them in subtler detail, we can observe them under exact conditions.

No doubt, if we proceed with such observations, we can secure a large number of psychological laws. To mention one which we may use as a typical illustration, we may think of a law which has been known as long as psychologists have studied the human mind, a law formulated by the first great psychologist, Aristotle: the law of association. If we ever experience two things together, the ideas of the two become linked in such a way that whenever the one idea is brought to our consciousness again the other idea arises too. Everyone has observed that. We have met a man and we have heard his name, and that visual idea of his face and that acoustical idea of his name were tied together; the law of association makes it necessary that, if we meet the man again, his name comes to our mind, or if we hear the name we remember how he looks. From such a loose, vague form the psychological observation can easily be carried to very exact connections, which can be verified only by careful studies. We shall find in the course of our work many such psychological laws which characterize the regular behavior of our perceptions and memories, our feelings and volitions. They are the condensed expressions of frequently observed uniformities in the succession of psychical contents. But can they really furnish us a true explanation, and are they sufficient for the causal understanding of our mind?

The first fundamental difficulty with an explanation of mental life through such psychological laws lies in the evident *disconnectedness and incompleteness* of the material in consciousness. This shows itself in a twofold form, on the one side in our perceptions, on the other side in the ideas, volitions and higher mental processes. Indeed, how could we hope to explain by any observed regularities in the mental content the appearance of the perceptive impressions. I hear at this moment the ringing of

bells, that is, the tone sensation arises in my consciousness. If I were to rely on strictly psychological explanation, I should have to seek in my own consciousness for causes which effected the appearance of this sound impression. But nothing in my mind suggested to me the coming of this sound. I did not think of bells before, which might have produced in my mind the tone sensations. My mind was filled with entirely different contents, when suddenly these tone sensations of bells broke in. Nothing which preceded in my consciousness seems to offer the least foothold for the explanation of these tone sensations. But the same is true, of course, of every visual impression which comes to my mind or of every touch, of every word which is spoken to me and of every printed line which I read. Everything enters into my consciousness as a new content for which I cannot possibly seek the causes in the preceding contents of consciousness, and for which, therefore, any explanation through strict psychological laws seems illogical.

But the other aspect of the incompleteness is no less striking: complex ideas, words, impulses, emotions, thoughts arise constantly in our consciousness without any preceding contents which could really explain their appearance. We try to think of a name, and, while we are in the midst of entirely different engagements, the name suddenly pops into our head. We were occupied with a problem, and, after we were no longer thinking of it, the solution appeared over the horizon of our consciousness. A melody arises in our mind, a fancy of imagination appears, without any noticeable cause, a mood takes control of us, we do not know why. But we can go much further. Let us think of the case of ordinary speaking. In common conversation the words come to our mind, while we are speaking them; we are generally not aware of any causes in our consciousness which determine the selection of the particular words. We hear the question and we give the

answer offhand before we discover in our consciousness any ideas which may lead to the reply. It is as if just the connecting links of thought are left out, or, rather, are hidden from our conscious awareness.

This fundamental difficulty has led to two types of theories, both of which seek to explain the coming and going of the conscious contents by agencies and processes which are not in consciousness. They leave the sphere of selfobservation in order to supply a connected chain of causes and effects. The one puts the responsibility on psychical processes which lie outside of consciousness: it is a theory of *the unconscious mind* or of the subconscious. The other seeks the explanation not through psychical causes at all, but turns to the brain processes of the organism, explaining the changes in the mental life indirectly by *changes in the nervous system*. We must examine the right and wrong, the value and the limits of both schemes of explanation. The unconscious has the first right to be considered, as it has the advantage of remaining in the world of the psychical.

The Unconscious.—Mental processes which are not contained in a consciousness are usually called unconscious. But this word is often carelessly used for processes which do not really lie outside of consciousness. Especially in the study of abnormal mental life we frequently use the term unconscious, where we actually mean that the content of an experience and the act of experience itself are entirely forgotten. The somnambulist who awakes in the morning and finds that he wrote a letter during the night, of which he no longer knows anything, is said to have written it unconsciously. But we have no reason to believe that during the act of writing he was not fully aware of his activity. He saw the letter paper as if he were in a normal waking state. The abnormal happening consisted rather in the fact that this conscious experience left no memory traces in his mind. As we are accustomed to remember

what was in our consciousness, everything which is entirely extinguished appears to us as if it never had been in our consciousness. We find the same abnormal processes in certain mental diseases or in hypnotic states and in all such cases we have no right to relegate to the unconscious that which has slipped from consciousness and which cannot be brought back.

Again we often say that something was not done consciously where we really mean that it was not done with a full harmonious use of all mental energies. The man who is poisoned by a drug or who is in the delirium of fever or in a state of drunkenness or in the midst of an attack of mental disease may behave without selfcontrol and without the regulation by the idea of his own self. Hence he may be considered not responsible for his actions. We may even say that he has acted without selfconsciousness, but we have no right to say that he was unconscious. The content of his consciousness was chaotic, but his ideas and emotions and volitions, however disorderly, passed on just as much in consciousness as if he were in normal health.

We are here interested only in those mental processes which are really not in consciousness at all, and only these are covered by our term. Yet it is doubtful whether the word unconscious would be the most significant. It too easily suggests anything which is not conscious and that means that the whole physical universe could be called unconscious too. If we want to separate the unconscious stones on the street from the unconscious mental states in ourselves, we shall have to call these psychical processes subconscious. As the iceberg in the ocean shows only its smallest part above the surface of the water while far the largest part is below, a small part of our mental contents can be found above the surface of consciousness, while most of them remain below, subconscious.

This theory is widespread and popular, because it fits

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knowledge which we can call back, everything which we have seen or heard, tasted or smelt, must linger somewhere in that obscure region. Such an assumption is from the start utterly fantastic. In consciousness ideas interfere with one another, feelings inhibit one another; we cannot be happy and miserable at the same time. But in the paradise of the subconscious the lion and the lamb are to lie down together. The millions of impressions and joys and pains and feelings exist subconsciously together without destroying one another. Ultimately such a hopeless theory is nothing but a crude materialism. The mental ideas are treated as if they were little balls or cubes which can be piled up, and this means that the ideas are imagined to be like physical things which last. Our inner experience demands a very different view. The conscious states are processes which take place, and when the process is ended it remains no more than the tunes of the piano remain in the piano case or the athletic movement in the muscles. We can think the same idea always anew, just as we can play the same melody on the piano or perform the same athletic feat. But we cannot imagine that the tones are hidden in the strings of the piano and the muscle movements kept in store in the limbs. ✓

Hence it is at least an improvement, if it is claimed that *not the ideas themselves remain in the subconscious, but only dispositions* for the appearance of the mental processes. The mind somehow holds traces of all the French words and historical dates which we learned, but these traces are not real syllables and sounds but only slumbering dispositions out of which through the activity of the mind new copies of the old ideas can be generated. Can this really help us? If the appearance of a conscious process is dependent upon a subconscious disposition, how are we then to explain our perceptions of the outer world? I hear the bells ringing. The sounds enter my consciousness. Must I suppose that I have a subconscious disposi- ✓

tion for these bell sounds, and even for this new melody of the bells which I have never heard before. Of course, then I must have such a disposition for everything on earth which can enter into the sphere of my senses. I must have a disposition for the smell of the chemical substance which some chemist may produce to-morrow in his laboratory. All those dispositions resulting from my little personal experiences are then insignificant compared with the trillions for all which may possibly become the object of my sense perceptions.

But as soon as we take refuge in such an unlimited hypothesis, it becomes entirely useless. If there is in our mind a disposition for everything imaginable, it can no longer serve as an explanation for the particular idea which comes to our mind. Then we must have the dispositions not only for the French words which we learned, but also for the Chinese words which someone may teach us later. Yet no one would accept such a gigantic apparatus for the explaining of our sensations. It would seem so much more natural that I hear the bells because the sound waves of the bells reach my ear and stimulate my ear nerve and finally my brain, and that my brain excitement is the real cause for my hearing the sounds. We are practically relying on such a theory all the time. We do not feel surprised that even the newest color and taste and smell awake impressions in our consciousness, because they have somehow stimulated and excited our eye and brain. We do not demand a special psychological disposition besides. At any moment the perceptions of our senses can arise in our consciousness without any subconscious mental dispositions, simply through the excitation of our brain. Then is it not illogical to require such mental forerunners in the case of the memory ideas, instead of seeking here too the causes in a brain process, as in the case of the perceptions?

The Subconscious Operations.—The other function of

the subconscious was that of the selective activity, of awakening and stirring up, of inhibiting and suppressing, of linking the ideas and connecting the thoughts in order to produce those results which finally appear in consciousness. We know that many a problem is solved in our mind without our following the process step by step in consciousness. We form our decisions, we shape our plans, we get our inspirations in processes of which we know consciously only the beginning and the end, but all the necessary interplay of ideas and all the linking of motives which evidently lie between must have gone on in the subconscious. Hence the theory insists in the interest of explanation that exactly the same mental processes which go on in full self-conscious attention can proceed also in the subconscious underworld. As soon as this is granted, it seems as if all difficulties were removed. The processes below consciousness offer themselves the more conveniently as no one can know them from direct observation and anything can be ascribed to them which seems desirable for a neat explanation. The most complicated mental operations can easily be attached to such an unconscious mind. Just here, however, we are working under a complete illusion, which we must dispel.

In the interest of explanation we postulate that the same mental operations can go on subconsciously which we know from our conscious experience. But we do so before we ask the decisive question, namely, whether even those conscious operations are really able to produce the mental effects. It may be that we are unable to explain any mental results by those processes which proceed in consciousness. In that case it would evidently be absurd to explain them by the same processes below consciousness. And just this is indeed the case.

The ideas which follow one another in consciousness may appear in their order thousands of times; and yet the mere fact that they occur again and again does not link them to real causes and effects. They follow one another,

but no causal necessity binds them together. Take once more the case of the association of ideas. The flower I see by the roadside brings to my mind its botanical name which I learned years ago, and if someone mentions to me the name of the flower, that brings to my consciousness the visual image of the flower, as I saw it before. I rely on that power of my memory, just as I rely on the laws of electricity which make the lamp burn when I turn the switch. Certainly my memory may not render the service at a particular time; I may have forgotten the name or the picture of the flower may have faded away or I may confuse it with a similar plant. But this does not interfere with the working of the association law, any more than the laws of electricity are to be given up because my lamp may be burnt out or the contact of the switch may have become defective. Yet there remains a fundamental difference between any such psychological connection and a physical one.

The physicist sees before him the goal of bringing all the processes in nature ultimately to mere mechanical movements of atoms. This alone gives a definite meaning to his view of the world. The mere observation of regularities is only the starting point for him. What has happened a hundred times may be different the hundred and first time. He has a right to predict the event for the hundred and first time only if he can recognize the necessity of the process; and this is reached only if he can bring it down to mechanical movements of the smallest particles. Under the pressure of such a demand he develops his physical theories of ether waves and so on, and splits what he calls atoms at one stage into still smaller fragments like the electrons, but he can never rest until he sees somehow the connection between the mere observed regularity in nature and those necessary mechanical movements. The natural scientist may be in many fields of physics or chemistry still very far from this ideal, but it remains the guiding

star. He takes it for granted that if he knew the whole truth every change in the outer world could be explained by a mere change of position of the smallest parts. No theories, not even the new ones of the dynamic type, have really altered these scientific assumptions, as long as the theories really aimed toward scientific explanation and not to a mere purposive interpretation of nature. On this background the scientist has a right to claim that all his laws are meant as expressions of causal necessity.

The psychologist has nothing to offer which is similar. He cannot speak of such necessity in the connection of psychical facts in consciousness. This is not because psychology is still too incomplete and too far from its goal, but because this cannot possibly be the goal of psychology. *It lies in the nature of the psychical objects that, however much regularity we may find in their behavior, they can never be directly linked by causal necessity.* We may observe that the flower brings us its name or that the name brings the picture of the flower, but that mental impression of the flower and that mental idea of the name are simply two events which follow each other, while we have not the slightest insight into a mental mechanism which could be supposed to link them. The whole play of connection in the physical world is conceivable, because every bit of those physical objects remains and changes only its place. The candle may disappear when it burns down, but every atom of it can still be traced in the atmosphere. Of the mental objects the opposite is true. The single mental experience is an act which is going on but which does not last, which cannot be found again anywhere in the mental universe. We may have a thousand times new ideas of the same object, but the same idea cannot come back a second time. The same hope, the same anger, the same desire, the same decision cannot be brought to consciousness once more. If we feel and will with the same intent, we must go through the performance

anew; we cannot revive the withered will of yesterday, and, where nothing lasts, we cannot conceive a really necessary connection.

This is not accidental; it cannot be otherwise. This whole splitting of our experiences into physical things and into mental things is artificial and is not suggested by immediate experience. We do not find the flower in the field and beside that our perception of the flower in our mind. The flower which we pick there is neither that complex of atoms of which the physicist speaks nor that content of consciousness of which the psychologist speaks. It is both in one, and it is in the interest of explaining the world that we divide that impression into two parts, the physical and the mental object. We call physical the object in so far as it can be grasped in ever new experiences; it is a physical object in so far as everyone can look at it, and as we ourselves can return to it ever anew. On the other hand, we call the object mental in so far as it is given only in the one act of our personal awareness. This then involves that the physical object lasts and that its parts can never disappear from the universe, and that the psychical object can never exist beyond that one act of immediate awareness and that it can never reappear. The physical objects, accordingly, change only their positions and their movements can be traced through their necessary paths, because each particle lasts. In consciousness no mental object can be followed up, because it can never last; it has given itself out in the act in which it appears in consciousness. Hence it would be meaningless to seek a true causal connection between two succeeding mental objects, however often we may observe their succession.

But if we must acknowledge that the psychical objects which we know in consciousness cannot furnish us with any understanding of causal connection, it is evident that the subconscious mental objects would not do it either. We wanted to introduce the hypothesis that there are subconscious ideas exclusively for the purpose of furnishing a causal explanation for the mental interplay. The as-

sumption was that those subconscious mental states might then produce the same effects as the conscious states. But as we see now that the conscious states themselves are unfit for a real explanation of causes and effects, it would be utterly useless to duplicate them in the subconscious. Even if such subconscious ideas and feelings and volitions existed, they could not contribute anything to the explanation: they would again simply follow one another without our understanding why they come and go. Such a hypothesis would be entirely useless. We must acknowledge that there is no causal necessity which directly links the changes in the world of mental objects. We know such necessity only in the physical world. ✓

Such a conclusion must not be misunderstood. It would be absurd to misinterpret it as if it were meant to say that there cannot be necessity in our inner life. On the contrary, all our thinking and feeling and doing are bound together by ties of inner necessity. If we think logically, the premises of our thoughts bind us in forming our conclusions. Our pledge binds our will in its actions. But this inner necessity which gives real meaning to our whole life and in which our duties and obligations lie, refers to the purposive aspect of our inner experience. If we take our thoughts and wills in their meaning, then, of course, they are firmly linked together. As soon as we come to the discussion of the purposive psychology, we shall see that everything there is controlled by this inner necessity. But here we are in the midst of the discussion of causal psychology in which the ideas and volitions are not looked on as purposes which we interpret, but as objects which we find in consciousness and which we want to describe and to explain. And only for this onesided objective aspect the last word must be that there is *no direct causal connection possible* and that it cannot be introduced by the construction of a subconscious mental machinery.

CHAPTER IV

PSYCHOPHYSICAL EXPLANATION

Connection of Mind and Brain.—We have seen that a real insight into the necessary connections of mental states cannot be gained and can never be hoped for from mental processes alone, whether conscious or subconscious. Only when we have recognized this fundamental difficulty in the efforts for psychological explanation can we understand the way which modern psychology has taken so successfully. It starts from the commonsense experience that our light and sound impressions depend upon the light and sound in the surrounding physical world. We find a succession of tones in our consciousness, because someone plays the piano. But everyone knows too that the mere existence of the physical tones or of the colored lights is in itself not sufficient to awake the sound or the red or the green in our consciousness. Those processes in the outer world, the vibrations of the string in the piano, or the light vibrations of the painting, must reach our sense organs, our ear or eye. If the eyelid is closed, the colors do not produce color sensations.

Scientific observations, however, easily lead beyond this matter of course knowledge. The scientist knows that it is not enough for the light rays to reach the eye, but that the nerve which connects the eye with the brain must be intact too. If it is cut or destroyed by disease, the light which falls into the eye cannot awake the light sensations in consciousness. Moreover even if the nerve is undisturbed, it is essential that those brain parts to which

the nerve leads be in working order. If by a hemorrhage in the rear part of the brain the so-called optical centers are made ineffective, the patient becomes blind. Hence the true connection between the physical and the mental event cannot be established between the light sensation and the light ray; it exists rather between light sensation and the brain process which is produced through the action of the eye under the stimulation of the light. Taste and smell, pressure of weight and contact and temperature must stimulate the sense organs first and then the nerve and finally the brain for sweet or sour, touch or warmth to be felt. Even if the physical process occurs in our own body, if a muscle is swollen or a tooth is revolting, the ache cannot be felt unless the nerve can conduct the irritation to the brain.

But it seems no less a matter of course that mind and body are *connected wherever an action is performed*. I have the will to grasp for the book before me and obediently my arm performs the movement. The muscles contract, the whole physical apparatus comes into motion through the preceding mental process of volition. The same holds true where no special will act arouses the muscles. If a thought is in my mind and it discharges itself in appropriate words, those words are first of all movements of lips and tongue and vocal chords and chest, physical processes which have followed the mental experience. The ideas and feelings may also be the starting points for other bodily changes. They may make a man blush as large groups of blood-vessels become dilated, or he may become pale because the blood-vessels are contracted, or he may cry because the tear gland is working, or his muscles may tremble, or his skin may perspire; his whole organism may resound with physical excitement which some words may have stirred up. The observations of the scientist here too link the changes which occur in the skin and the muscles and the glands and the blood-vessels with

the activities of the brain. The bodily effects of the inner states do not take place if the nerves which lead from the brain to these peripheral organs of the body are destroyed. If we press the movement nerve of the upper arm until it becomes inactive, our will is unable to move the fingers. But the nerve is again only the transmitter; the real beginning of the process lies in the brain. If the breaking of a blood-vessel has destroyed a certain part of the brain the patient is paralyzed, that is, his mental will can no longer move his arm or his leg.

The third group of facts seems very different from the first group, the perceptions. There we found that a brain excitement is the condition under which our sensations of color or sound or taste or smell arise in consciousness: an immediate coincidence of brain action and conscious experience. Here we notice only that some kind of brain activity has to start our will actions or our emotional responses, but we have in that no sign that the will or the emotion itself is accompanied by a brain process. It may be that the will or the feeling or the thought go on as psychological events in consciousness, without any parallel action in the brain and that they only end with passing something on to a brain center which realizes the activity in the nerves and muscles.

But the observation of effects is at this point naturally supplemented by theoretical reasoning. Let us look at the situation from the standpoint of the natural scientist. We find that muscles are contracted, that glands are producing secretions, that the blood circulation of the body is changed. These are evidently physical processes which the scientist must explain by the same principles by which he explains every other event in the physical universe. He takes it for granted that every movement of molecules is the effect of physical causes. If the chain of physical causes and effects were interrupted anywhere, and an atom changed its direction of movement without a foregoing physical cause, the event would be to him a miracle, a mystery, a destruction of natural science. He knows that not all causes are known to him and that especially in the world of the living organisms many processes are still unexplained to-day, but he can

never give up the assumption that a fuller knowledge would be able to explain them. This is the real foundation of modern science; it is the ideal which guides every effort of the scientist and he calls scientific truth that which brings him nearer to this ideal. He must go far beyond mere observations in order to fulfill this demand of thought. But he can never satisfy himself with the easy solution that at this or at that point an exception is to be admitted and an effect is to be recognized without a preceding physical cause. Where he does not discover the cause, he acknowledges an unsolved problem.

From such a strictly naturalistic point of view the brain process which starts the movement of our fingers or our lips cannot possibly be without foregoing physical causes. The scientist cannot call it an explanation, if he simply refers this brain excitement to the intruding of a mental will or a mental idea. In the closed system of mechanical causes the power of a mental idea to change the brain excitements would be as much of a miracle as if our idea changed the course of the moon. The true physical causes, accordingly, must be a brain process which coincides with those emotions or ideas or volitions. Only then can the great postulate of modern science, the conservation of physical energy, be satisfied by the actions in the organism. The scientific theory thus leads to the conclusion that all the mental states which seem to produce actions of the body are themselves accompanied by brain excitements. Hence the two large groups of facts which we considered, *the stimulations of the sense organs and the movements of the body, thus after all lead to the same interpretation*: in both cases the mental states, the sensation or the volition, need as a counterpart a certain brain occurrence.

We may turn to a *third group* of facts. If the temperature of the blood is raised in fever, the mental processes become confused: if hashish is smoked, the mind wanders to paradise. A cup of tea may make us sociable, a few glasses of wine may give us a new mental optimism and exuberance, a dose of bromide may annihilate the irritation of our mind. If we inhale ether, or if arteries in our

neck are pressed so that the brain is insufficiently supplied with blood, the whole content of consciousness fades away. A blow on the head may wipe out the memory of the preceding hours; a tumor in the brain may completely change the personality; a disease in certain convolutions in the brain brings with it the loss of the power of speech; inhibition in the growth of the brain involves on the mental side feeble-mindedness and idiocy. A pathological degeneration of certain groups of brain cells is accompanied by demented states.

We might point to still a *fourth group* of facts which seems to indicate the intimate relation between the brain and the mental processes. The comparative anatomist shows us that the development of the central nervous system in the kingdom of animals goes parallel with the development of the mental functions. Any special function of the mind may in certain animal groups have reached an unusual height, and then we see certain parts of the brain correspondingly developed. The dog has a keener sense of smell than man: the part of the brain which is in direct connection with the nerves of the nose is much bulkier in the dog's brain than in the human organism. The physiologist adds to these comparative observations his experimental results. He can demonstrate that electric stimulations of definite spots on the surface of a dog's brain produce movements of barking and whining, or movements of the front legs or of the tail. On the other hand the dog becomes unable to fulfill the mental impulses if certain definite parts of his brain are destroyed. Physiologists may show, from the monkey down to the pigeon, to the frog, to the ant, to the worm, how the behavior of animals is changed as soon as certain groups of nervous elements are extirpated. Of course the animal cannot furnish us with selfobservations. The dog may bark or whine: and yet be a mere physical machine, without consciousness. We are therefore on safer ground, if we

confine ourselves at first to the study of human beings, where both the physical outside event and the psychical inner event are observable and are the objects of communications. Even the diseased mind or the child's mind furnishes us with such selfobservational material. The patient can tell us what abnormal emotions oppress his mind, and the child can report to us what he sees and hears.

Psychophysical Parallelism.—We have shown that man's perceptions and memories, volitions and impulses, occur together with brain excitements. This, however, is certainly not a proof that every mental event is correlated with nervous processes. There may be some act of attention, some subtle feeling, some sudden decision, some flight of imagination, which is independent of any brain action. Here is the point where we must return to our previous argument. We saw, when we discussed the possible psychological explanations, that the appearance of a mental content can never be explained by any foregoing mental state. It lies in the nature of the psychical objects that they cannot be linked directly as causes and effects. Yet we acknowledged that the chief aim of objective psychology is to understand the coming and going of the mental states as necessary. One way to gain such an ultimate explanation of all mental events is evidently open. The psychologist has only to generalize what he has found out about the impressions and volitions and the effects of drugs and of brain diseases. He has to go forward to the *general postulate that every single mental state be understood as the accompaniment of a special brain process*. This is exactly the assumption upon which the scientific causal psychology of to-day depends.

It would be very superficial to deny that such an assumption goes beyond what is at present the result of actual observation. It is ultimately a postulate. But every science begins with postulates and only those statements

which fulfill them have the dignity of truth in the midst of that scientific realm. The astronomer knows that he has not understood a movement of the stars until he has found the causes: he presupposes that no star moves simply by magic power and that nowhere in the astronomic universe the chain of causality is broken. In the same way the psychologist who aims toward explanation of psychical states assumes that every mental state is an accompaniment of a physical brain process. Only when such a framework of theory is built up by a general postulate can those observations of the laboratory, of the clinic, and of daily life, find their right setting. We may still be unable to point to the special brain process which lies at the bottom of a particular mental state: and yet, if the assumption is accepted, we know beforehand that there is no shadow of an idea, no fringe of a feeling, no suggestion of a desire which does not correspond to definite processes in the brain. The details may and must be material for diverging opinions, but the conflict of such hypothetic theories has nothing to do with the certainties of the underlying conviction that, if we knew the whole truth, we should recognize every single mental happening as parallel to a physical process in the nervous system.

It is indeed evident that such an assumption is perfectly sufficient to fulfill our demand. If every mental element is somehow bound together with a definite process in a particular brain part, the physical interplay of the brain processes can now be used to explain the coming and going of these mental states. We saw that the physical world to which the brain and all its millions of nerve cells belong is conceived as controlled by causality. One brain process must lead to the next brain process. If the first is accompanied by one mental state, the second by another mental state, we can explain indirectly why the one psychical event is succeeded by the other. If hearing the name of our friend brings back to our mind the memory image of

his face, no causal necessity binds that word impression and this face impression in our mind. But if that word impression is linked with one brain excitement and that face impression with another, and if we can show that by physical laws the first brain state must be followed by the other brain state, we explain indirectly why the hearing of the name must stir up the seeing of the face.

Of course the explanation must not be sought in a wrong direction. Such a theory does not in the least explain to us why certain brain excitements are accompanied by the sensations of blue or red or sour or salt. But that is not the aim of our explanatory theory. The brain process is not to figure as the cause of the sensation, nor the sensation as the cause of the brain process. The various elements from which our content of consciousness is built up are ultimate facts for the objective psychologist. Sour is sour and salt is salt: the difference between those two mental states is something which must be accepted and can never be explained by the brain processes. The excitement in the nervous system and the content in the consciousness are entirely incomparable, and it would not contribute anything to our understanding, if we called the one the cause of the other.

The real aim of the theory is entirely different. We are to explain *why these sensations or feelings or volitions arise and disappear in a certain order in spite of the fact that no direct connections exist among them*. We do not want to explain that a sensation *a* or a sensation *b* exists, but we want to explain and must explain why the sensation *a* is followed by the sensation *b*. We do that in showing that sensation *a* is always present when the brain process *A* occurs, and that sensation *b* is always present when the brain process *B* is going on. Between *A* and *B* is a true causal connection. If *A* precedes, *B* must necessarily follow, and this brings us to an indirect understanding of why sensation *a* is necessarily succeeded by sensation *b*.

As soon as we recognize clearly the real aim of such a theory, it becomes insignificant to us what kind of a metaphor we use to present it to popular imagination. A favorite term for it is "*psychophysical parallelism.*" The comparison with two parallel lines suggests indeed very well that every change on the psychical side must correspond to a change on the physical. Yet we must not forget that this relation is not reversible. Most of the brain processes are not accompanied by psychical states at all. If we call those processes in the nervous system which have their psychical accompaniment "*psychophysical processes,*" we certainly have no right to consider the psychophysical processes an uninterrupted chain. Purely physical processes lie between them. Of the two parallel lines which the metaphor suggests, only one, the physical, is continuous, while the other would have to be drawn as a broken line, which often exists only in single dots.

The theoretical discussion has to end with this general postulate of parallelism. How it can be fulfilled, which mental states are to be correlated to which brain processes, and which laws control them is not to be deduced from theory, but from the detailed study of facts. The further elaboration of the psychophysical system thus belongs to the special part. But the whole special part has to be built up on this foundation. It would be an illusion to fancy that any observations could alter the postulate with which we start. It is the assumption by which causal psychology is possible at all. Every observed fact must be reconstructed until it can be inclosed within the general frame of the psychophysical theory.

CHAPTER V

SCOPE AND METHODS OF CAUSAL PSYCHOLOGY

The Subdivisions of Psychology.—Wherever mental life exists, it must be possible to take the objective point of view toward it and to consider it as a content of an individual consciousness. As such, it is material for the description and explanation. Hence the realm of causal psychology is as wide as that of mental life. Where the furthest boundary of this realm lies may seem debatable. There is only one test for the existence of consciousness, namely, our subjective, practical acknowledgment. If someone acknowledges the reality of inner attitudes in the spider, but not in the jellyfish, we have no objective method to prove that the mental life begins at another stage. Not a few feel inclined to extend the realm even further down and to acknowledge mental life in the reactions of certain plants when they turn toward the light or respond to contact. Very little depends upon such shifting of the lower limit; we certainly all agree that from the insects upward to the leaders of mankind we have a world of mental life in which many different degrees of mental development and mental complexity can be found. A real comparison with the lower forms of mental life does not lie in our compass. We shall emphasize the biological aspect and the continuity of the development, but the interest in man's mind is our predominant issue.

If we are to draw one decisive frontier line between two large groups in human psychology, it ought to be between the mental life of *the individuals* and that of *the social*

groups. Of course, there is no mental process in the social group which is not contained in individual minds. The inspirations and impulses and ideas of a nation are, as material for causal psychology, only contents of consciousness in millions of individual persons. And yet the psychologist has good reasons to acknowledge the significant difference. The circle of those who are mentally combined in society may be large or small, may be a state or merely a family: in any case the combination of such individual cerebral systems is far more than a mere summation of the single members. New forms of psychophysical life and new results arise from the mutual influence. Here really a new kind of psychological experiences is found and new groups of psychological interests are touched.

We shall accordingly divide the causal psychology into individual and social psychology. At one point the two fields overlap. The large group of interesting facts which refer to the *individual differences* of men may just as well be treated in the one as in the other department. If we study individual psychology, we are led from the simple states to those most complex formations which constitute the personal individuality. The end point of individual psychology is therefore the observation of the individuals in their differences. But this is exactly the starting point for the social psychologist. Society might exist through the combination of individuals who are all alike. But the society which experience really shows us receives its manifoldness and its complexity above all from the great variety of persons who enter into it. Society is a combination of unlike individuals, and to consider the individual as a member of society means first of all to characterize him in his difference from the other members. For this reason we shall often point to personal differences in the discussion of individual psychology, but the real study of personal variations will be the introductory chapter of our social psychology. The same double function is

characteristic of child psychology and abnormal psychology. We shall refer to the mental facts of childhood and of disease in discussing the mind of the individual, but we shall consider them chiefly when we deal with the human differences in social psychology.

All the other usual groupings of psychological facts refer to other aspects. The discrimination, for instance, of educational psychology, legal psychology, medical psychology, industrial psychology, refers to the standpoint of the practical psychologist, which will interest us in the last part of the book. On the other hand, if we speak of experimental psychology, physiological psychology, comparative psychology and so on, we do not characterize different groups of material, but different methods by which this material is to be mastered.

To be sure the term physiological psychology can mean not only psychology as studied by physiological methods, but also psychology as an account of mental states in their relation to physiological brain processes. To us this is not a special part of causal psychology, inasmuch as we have convinced ourselves that we cannot have psychological explanation at all, if we do not consider every psychical process as part of the psycho-cerebral correlation. We may have to deal with individual or with social psychology, with animal or with human psychology, with child psychology or with abnormal psychology: in every case we deal with physiological psychology, even if we often abstract from the physiological aspect.

A more dangerous characterization of psychology is proposed by the too frequently used term functional psychology. The word is so easily misleading, because it has at least two entirely different meanings. The difference becomes clear through the contrast to structural psychology. The structure of the mind and the functions of the mind are related to each other as the anatomy of a bodily organ is related to its physiology. The one has a static, the other a dynamic, character. Structural psychology describes that which can be found in consciousness at a given instant, and functional psychology shows how

successive mental states are parts of a process which leads to certain ends. The one takes a cross-section of the stream, and the other follows the stream itself.

If we interpret the meaning of structural and functional psychology in this way, it is clear that they belong intimately together. The functional aspect is then not in the least contradictory to the structural. They supplement each other, and while we discuss the function, we never forget that it is described in constant reference to the structure. Both are essential parts of causal psychology. But the term functional is just as often used with an entirely different meaning. The function is then no longer a series of describable objective states analogous to the function of a bodily organ. But it is the mental act itself in its purposiveness, as it is experienced in the attitude of the self. Functional psychology is then entirely removed from the world of describable objects and understood as an account of those functions in the personality which point beyond themselves and are felt as deeds of the subject. In short, it is the psychology which we call purposive. If the word functional is used in this sense, it does indeed stand in contrast to structural psychology and the latter term is then usually expanded so far that it covers the whole ground of causal psychology, including the structural account of mental functions.

In order to evade the difficulties of this double meaning, we shall avoid this too popular phrase altogether. It has greatly hindered the mutual understanding in modern psychology. This, however, in no way means that we shall neglect either of the two different accounts of functional psychology. As far as it is the same as our purposive psychology we shall present its claims in full detail, as soon as we have ended the discussion of causal psychology. On the other hand as far as it means the dynamic aspect in the midst of causal psychology, we shall certainly do the fullest justice to it as it is only the natural consequence of the theory of psychophysical parallelism which we have accepted. If the mental states are understood as accompaniments of brain processes, they are completely linked with the bodily life of the organism and through it with the whole psychophysical development. This whole psychocerebral process will appear to us as the central part of that complex biological func-

tion by which the individual adjusts himself usefully to his surroundings. The psychophysical process thus enters into the system of organic reactions, which can never be understood if they are not related to their useful effects. Hence we are everywhere obliged to emphasize the functional aspect in the midst of causal psychology, and any effort to confine the work to a mere structural account would leave out the most important and the most interesting feature.

Selfobservation.—If we were to divide the whole realm of causal psychology from the point of view of the various methods, the fundamental division ought to lie between the psychology based on *selfobservation* and the psychology based on the *observation of others*. The division line must not be misunderstood. The material which the psychologist secures by the method of selfobservation is certainly not confined to that which he finds in his own personal consciousness. All the mental experiences which fellow-workers observe in themselves and report to him count for him just as much as if he had observed them in his own mind. As soon as we are in the midst of psychological work, we cannot go back to philosophical doubts concerning the reality of the fellow's mind; we take it for granted that he can observe his content of consciousness as well as we observe our own. If somebody else describes to me his afterimages or his headache, I accept it as material gained by the introspective method just as if I myself observed the colors or the ache. The essential point is not whether I or someone else experiences it, but whether the observer and the observed are the same person, or not. If the child simply cries and laughs, he experiences the feelings, but I observe them; the case is therefore not one of selfobservation. And if the melancholic patient shows to me that he is brooding on sad ideas, again I am the observer and he is the observed. If we call the psychological observation which is not introspective an indirect observation, every study of the mental life of animals or of

infants or of seriously diseased persons will be mostly indirect. Moreover we may carry on indirect observations on any one of our neighbors who on another occasion may furnish us with direct observational results. The one easily shades off into the other. The child may describe his inner experiences, and we gain through this introspective accounts; and yet we may at the same time observe the child's behavior and draw indirect conclusions as to his inner states, which may be very different from his own reports.

Selfobservation or introspection is certainly the fundamental method. Yet we cannot deny that it is surrounded with serious difficulties. They can be found in various directions. The method of introspection has often been denounced because it is an activity which goes on in the same mind in which the processes occur which are to be observed. As all activities in our mind influence one another, it is to be feared that this effort to observe the inner changes often destroys its object. There is an element of truth in this. If a poem has filled our mind with a subtle, delicate feeling tone, and suddenly our scientific effort of selfobservation breaks in so as to fixate those shades of feeling, the chances are great that the whole affection may evaporate, because it was disturbed by the entirely different mental setting.

If we are depressed or angry or enthusiastic for men or events, we are hardly able to turn our introspective attention on these inner excitements, and if we force our will to introspecting, the enthusiasm or the anger will be inhibited. But we can well combine the will to observe with the undisturbed experience of a perceptive impression or of a memory image or of imaginative experiences or even of a thought. Moreover the emotional and volitional excitement which does not allow a neutral spectator on the fence of our consciousness may be brought back by a later act of memory, and we may observe and analyze by intro-

spection to-day the emotional excitement of yesterday. Above all the ability to live through a mental experience in its original freshness and yet to take inner snapshots of it may be strongly developed by training. Anyone interested in psychological analysis can acquire a certain skill in combining the attitude of observing with the practical life attitudes, just as we can learn to perform two different movements with the two hands without mutual interference.

Even if our selfobservation is careful and backed by knowledge of the bodily processes, it is evident that it must be confined to those chance experiences which the stream of life bears to our shore. Every individual experience is narrowly limited, and if we observe only what the accidents of the day bring into our sphere, our material will be scanty and insufficient for a systematic study of mental possibilities. Many selfobservers may bring together the outcome of their introspection; yet the results must be haphazard as long as they are confined to that which presents itself to them by chance. Worst of all, these results must be extremely vague and rough. Really careful and subtle discrimination is hardly possible, and the comparison of the effects of different conditions cannot be expected, if the conditions themselves are not under control. Unaided selfobservation, therefore, appeared a satisfactory method in the history of human thought, only as long as psychology was essentially a speculation about the human soul. The vague general impressions which the thinker received from the working of his will or emotion or memory were sufficient as starting points for the soul philosophy which did not have to be a science of experience.

But since the psychologist has turned into the new path, and like the naturalist aims toward the goal of scientific description and explanation, the merely occasional glances at his own mental life can no longer satisfy the student of the mind. He must on the one side supplement the self-

is a department with special objects, but as a scientific method needed to discover the subtler interplay of the normal mental functions. The diseased mind is composed of the same elements as the normal mind: only their proportion is changed. There is too much or too little of one or another mental feature. To observe the distorted mind therefore helps us in the understanding of the normal harmony and proportion, as a caricature may help us to recognize the proper interrelations between the features of the face. The study of the abnormal is in this case not controlled by the interest in the traits of the disturbed mind, but in their value for the analysis of the normal mind. In the same way child psychology may serve as a method. We compare the consciousness of the adult with the simpler and simpler forms in the mind of children; we may trace the ideas of space and time and number, or the ideas of one's own personality or the ideas of fellow-souls and similar highly complex structures in our mind down to the elementary forms in youth, in childhood and in infancy, and understand their composition through the comparison. The study of different species or of different races, of different ages or of different pathological variations is indirect in so far as the observer is not the observed, but it brings at least the organism into the field of direct observation. We can go still a step further and gather mental material from individuals who do not come into contact with us at all.

We have this in the case of statistical results, which, especially in the form of the so-called moral statistics referring to occupations and vocations, crimes and suicides, marriages and divorces, education and religion, and many other results of psychical motives in the national body, are important for the study of social psychology. Another line of study is opened if we turn to the archives of history. The records of the past, with their accounts of unusual minds, heroes or artists, martyrs or criminals,

all speak of mental structures and mental functions which are sufficiently different from the routine mind to attract the interest of the psychologist.

This again must be supplemented by the study of the objective products of minds: it may be the work of individuals, such as an artistic or scholarly or religious or political creation; it may be the achievement of the masses, such as languages or laws or customs or policies or religions. They all reflect light on the mental mechanism which brought them into existence. We can study the differences of minds in studying the differences between the works of architecture which old India or Egypt or Assyria or Greece or Rome have left to posterity; and the changes of the historic languages can be understood as the products of simple psychophysiological processes, which repeat themselves in millions of individuals. We might even take a last step and acknowledge that the poet also furnishes us with material which allows observation of mental processes. The persons of his epic and dramatic works are not real, and he himself is not a causal psychologist, as he creates minds, but does not describe and explain them. But if we usually call a great poet like Shakespeare a great psychologist, we mean that his imagination has created individuals whose mental acts are so lifelike and internally true that the psychologist can substitute them in his studies for real personalities.

Experimental Psychology.—Thus direct and indirect observation combined can bring an abundance of material from the marketplaces of life to the workroom of the psychologist; and yet of this indirect study it may be said, as we had to say about the direct introspection, that true thoroughness and exactitude cannot be reached as long as everything is left to the chance offerings of nature. The chemist and the physicist do not leave it to the current of natural events to bring up the phenomena which deserve scientific interest. They build their laboratories and

produce there artificially conditions under which the observations can be repeated in ever-new forms and under complete control of the factors which enter into the event. The experiment of the naturalist is indeed nothing but the observation of the physical or chemical processes under conditions which are artificially introduced for the purposes of the observation. The psychologist too can hope for a perfection of direct and indirect observation only if he introduces experimental methods. In the persistent effort to make use of the experiment for the study of causal psychology lies the most characteristic feature of the psychology of the last decades.

This was the decidedly new turn on account of which modern psychology is not seldom called the new psychology, in striking contrast to the preceding two thousand years of psychological interest. In the past the study of the mind, in spite of its essentially philosophical character, did not lack elements of empirical observation, but the observations were confined to mental life under natural conditions. With the middle of the nineteenth century *the observation under artificial conditions* begins. The psychologists themselves were not the leaders in the new method. The physiologists who studied the functions of the eye and ear and of the muscles were led to experiments which threw light on mental facts and gave the strongest impulse toward an independent interest in mental experiments. Suggestions came also from other neighboring sciences. Physicists examined experimentally the relations between the strength of the physical impressions and the inner sensations. Even the astronomers found reasons to experiment with regard to mental functions, as it was observed that the correct observation of the stars depended upon mental conditions, which varied among different observers. It became necessary to measure the rapidity with which the individual mind reacted on the astronomical stimulus, and that led to general experiments

on the quickness of mental processes. Not a few psychological experiments were carried on in this way before the psychologists began to establish special laboratories for their own purposes. The first institute, which was to be the mother institute of most psychological laboratories the world over, was founded in Leipzig in 1879. It was devoted exclusively to selfobservation under artificial conditions, and it naturally began with such simple experiments as those which had been carried on in the neighboring fields before. The development was an unusually quick one; the movement spread to all countries, Germany and the United States leading in this new interest. America has at present more than half a hundred psychological laboratories.

The internal development, however, was still more rapid. In its early days it seemed a matter of course that only elementary processes would be accessible to experimental methods. The borderland regions between mind and body, the sensations and perceptions, space and time problems, the simplest association and reaction questions were the natural field, while the higher mental activities seemed beyond reach. But, as soon as the psychologists had their own keys, many new doors could be opened. The experimental method was soon successfully brought to the study of memory and of attention, later of feelings and emotions, of thoughts and esthetic states and volitions. Certainly the experiment under laboratory conditions is as yet not equally developed in all regions of mental life, and is so far better adjusted to the problems of perception and memory than to those of emotion and will. Yet it can be said that there is no group of mental processes which has not been made accessible to the experimental method.

But the triumph of the laboratory is not confined to the rich development of methods for exact selfobservation. Its aid is no less significant in the regions of *indirect observation*. The old animal psychology consisted of anec-

notes of dogs and horses, hunting stories and onesided interest in the mental life of ants and bees; the experiment transformed it into an exact science which traces every mental function through the whole kingdom of animals. Child psychology was not in the same degree dependent upon experimental methods, as the opportunities for steady observation under natural conditions were more favorable, and much excellent detail had been observed by parents and teachers before the experiment aided the study. Moreover it is evident that the hygienic interests of the child set rather narrow limits to persistent experimentation. Yet here too the experiment has been applied with full success from the reactions of the infant in its first minutes of life to the complex mental processes of the adolescent. In the same way the laboratory method has shed new light on the disturbances of the diseased mind, and still more on those abnormalities which lie in the borderland between health and illness. Moreover in the sphere of mental abnormality the experiment has taken still another form. The aim is not only to carry on experimental studies with the abnormal mind, for instance, research on the abnormal memory or intelligence or feeling, but to produce by experiment abnormal mental states in otherwise normal men. The typical case is that of hypnotism. The hypnotic experiment is certainly an effective means for the discovery of many psychological facts which cannot be studied under normal conditions.

The whole science of psychical life is thus revolutionized by the methods of experiment, and throughout has been victorious in this sign. But its strength ought not to be misinterpreted. We have emphasized before that the experiment does not stand in contrast to selfobservation and is by no means superseding it, but only aiding it. We have to add now that it is no less misleading, if it is brought into contrast with the qualitative analysis of mental states and is glorified as a scheme to perform a quantitative measurement of the conscious experience. On

the surface it looks indeed as if the laboratory work were measuring mental states as such. If we look deeper, we recognize that this is an illusion. All which we measure are physical quantities and all the figures which enter into our laboratory report refer ultimately to physical conditions of mental experience. The mental experience itself remains only a qualitative phenomenon. The mental states are alike, or are different, but one never contains a number of others. A physical ten-candle-power light contains ten times the light of one candle, but the psychological light impression of the strong light does not contain so and so many times the light impressions of the weaker. The strong and the faint impression are different, but we cannot find the one in the other. All physical measurements are based on the counting of units. The ten-foot distance contains ten times one foot. But in the world of impressions or other mental states neither the contents themselves nor their differences from one another can be put together and summed up.

If we call two mental states equal, the term must not be used in the mathematical sense. It means only that we do not discriminate qualitative differences. If we were to apply arithmetic to the mental relations themselves, we should be entirely misled. If we start with a red sensation and go through all shades of red orange to orange and so on by smallest steps to yellow and green and blue and violet and purple, we can count the number of just noticeable differences, and this number would be much larger for the distances from red to purple throughout the rainbow colors than from red to green; and yet psychologically red and purple are very similar, and show a very small difference, while red and green are very different. The knowledge of ten pages of text is not ten times the knowledge of one page; the memory image of two men is not twice the memory image of one man; we cannot have the same anger or the same volition three times. We have no right to believe that exact psychology has made the mental life itself measurable. The exactitude refers to the discrimination of qualitative differences on the mental side and careful measurement of the causes and effects on the physical side. This is not a weakness of present day psychology which the future may overcome, but it is one of the deepest characteristics of the psychical material itself.

Only one further methodological aspect must be mentioned. All the methods of direct and indirect observation under natural and under experimental conditions referred to the mental states and their relation to preceding or following physical events. We have not yet spoken about the ways by which the correlation between the mental event and the accompanying parallel brain process is determined. Such methods can hardly be called psychological, however important the results of such work may be for the theoretical explanation of the psychologist. In the foreground here are the methods of anatomy, of physiology and of pathology. The anatomist traces the connections between particular brain parts and the sense organs or the muscles, and in this way can throw light on the psychophysical functions of those nervous centers. The contribution of the anatomist becomes especially important through comparative anatomy. If certain mental abilities are characteristic of some animals, while they are rudimentary in others, the anatomist can find out whether a particular region of the central nervous system is highly developed in the one and undeveloped in the other group.

But the more direct aid to this side problem comes from the physiologist, who studies directly how far the artificial stimulation of a certain brain region produces in the animal an expression of mental activity and how far the artificial destruction of the same central region results in an interference with that particular form of mental behavior. And finally the pathologist gathers the material which the dissection of the diseased brain after the death of the patient exhibits. If certain mental functions had become defective during lifetime and the autopsy now shows a degeneration of special brain tracts, the pathologist links the mental and the physical disturbances. In the middle of the last century the discovery of characteristic lesions of the brain in cases of speech defects gave to

psychology an impulse in this direction which led to a long series of most important researches. These pathological observations, on the other hand, were constantly supplemented by the physiological experiments and aided by the rapid progress of comparative anatomy. In this way the theory of psychocerebral parallelism found its fullest development in the same few decades in which experimental psychology was unfolding. The results of both are combined in the system of modern causal psychology.

PART II. THE INDIVIDUAL PROCESSES

A. THE ELEMENTARY INDIVIDUAL PROCESSES

CHAPTER VI

THE NERVOUS SYSTEM

The Sense Organ-Brain-Muscle Arc.—If every feeling, every idea, every will act, every emotion must be considered as an accompaniment of brain processes, we must try first of all to understand these organic processes themselves, before we connect them with psychical experiences. We may look on the brain, accordingly, with the eyes of the physiologist, who seeks to reduce everything to physical and chemical changes in the cells of the body and who, from his standpoint, cannot be aware of any accompanying mental states. What are the character and the significance of the brain processes, seen from his viewpoint? Are they to him numberless chance activities in the cells of the brain, or can he unify them and illuminate the manifoldness by a simple principle? Let us compare the situation with the physiologist's interest in some other bodily organ. The heart is performing its complicated contractions, the stomach is producing its gland secretions. Does the physiologist ever feel satisfied with simply recording those physical and chemical facts? He certainly goes far beyond such a mere description of cell activity; he asks how far this heart contraction or stomach secre-

tion is useful for the purpose of our organism. Through this problem of usefulness, the physical-chemical mechanism is brought into an entirely new light. It leads to a true explanation of the organ and its development.

As soon as the biologist can show that a part of the organism is useful for its conservation, he can apply all the principles which the modern doctrine of evolution regards as vehicles for the advance of the race. He would be unable to explain a bodily apparatus which is unnecessary for the selfpreservation of the race. But if it can be shown that a particular variation of the body is helpful to the individual or its descendants in the struggle for physical existence, he understands that it gave to the organism a more favorable chance to survive and to transmit its traits to the next generation. To be sure, the biologist of to-day considers the process of race evolution not so simple as it appeared some decades ago in the high tide of Darwinism. Many new difficulties and many necessary side principles have to be acknowledged; and yet the fundamental principles stand. If we aim toward a causal explanation of the forms of animal life and not toward a purposive interpretation of the plans of nature, we must recognize in the usefulness of the organ the condition for its development.

But if this is the case, the biologist cannot consider the heart or the stomach as isolated organs. The contractions of the heart would be entirely useless, if there were no arteries and no veins connected with it and no lungs for the chemism of the blood; and the pepsin secretion of the stomach would be useless, if the whole system of the digestive apparatus from the mouth cavity downward were not connected with it. As soon as such a group of organs is understood as a unity, their combined action indeed appears indispensable for the individual and therefore explainable from the standpoint of evolutionary biology.

The brain of the frog as well as the brain of man would

likewise be superfluous and useless, if it were considered as an isolated apparatus. But everything is changed when *the brain is understood as the complicated central mechanism of a much larger system.* The brain is in direct connection with the outer surface of the body and with the sense organs on it. The eyes, the ears, the nose, the skin are linked by hundreds of thousands of nerve fibers with the sensory parts of the brain. At the same time the muscles which contract the peripheral organs of the body are connected with the motor parts of the brain, and in the brain itself the sensory and the motor parts are completely interrelated by millionfold paths. Hence the brain can work like a central switchboard through which the excitement of the sensory system, beginning with the stimulation of the sense organs, is transmitted to the motor system, where it ends with the contraction of muscles. The nerves which lead from the surface of the body to the brain are the centripetal part, and the nerves which lead from the brain to the muscles are the centrifugal part of one arc of which the brain is the central part. If this arc is considered as a whole, its unified function becomes evident. The sense organs are stimulated by the surrounding world, and the muscles produce the changes in the surrounding world. *The arc from sense organ through the brain to the muscle is the apparatus by which the organism can adjust its actions in the outer world to the conditions of the surroundings.*

The Development of the Nervous System.—We said that the biologist is able to explain such systems, in case that their physiological functions are useful to the organism. As soon as this arc from sense organ through the brain to the muscle is considered as such a mechanism by which the movements are adjusted to the surroundings, its usefulness is evident. An organism which had sense organs and brain and could receive inner excitements from the lights and sounds and odors and pressures of the world

could not survive if no nerves connected the brain with the muscles: and on the other hand a brain connected with the motor apparatus would be entirely useless if it were not influenced by the excitements of the sense organs. In both cases alike the organism would be helpless. But as soon as the motor action is a response to the sensory stimuli the conservation of the individual can be secured. It can escape the dangers, can withdraw from the injurious contact, can approach and grasp the nourishing substance, can attack the enemy and follow the prey.

If we look over the whole world of animals, we find that at every stage of development this useful correlation between sense organ and motor response is effective. It is just this usefulness of adjustment, this fitness of expression and impression which leads the naturalist instinctively to a psychological interpretation of animal behavior. The actions are so usefully adapted to the surroundings and so clearly serve the interests of the individual and its descendants that we always feel tempted to see in them the working of a selecting intelligence, or at least a conscious regulation by sensations and feelings and will impulses. The amœba which we watch under the microscope in a drop of water responds to the stimuli of the surroundings in a perfectly useful way. If a dangerous stimulus comes in contact with its surface, its contractile substance forms a ball and by that reduces the chance of contact to the minimum; if nourishing matter touches the same surface, it reacts by expanding and bringing its body as much as possible into contact with it. The monocellular being acts there as if it hated the one and loved the other, and as if liking or disliking had led to considerations and finally to will impulses. These useful reactions are so completely adjusted to the narrow needs of those lowest beings that we have no right to say that they are less perfect than the more complicated reactions of the higher organisms which because of their greater differentiation need

a much richer system of responsive movements for the struggle of life. The infusor is no less well adapted to the helpful and injurious conditions in his drop of water than the frog to those in his pond or the man of civilization to those in his metropolis.

But the biologist may stick consistently to his purely physical-chemical view, in spite of the apparent expression of intelligence. After a meal millions of cells in our organism perform the work of transforming the food into substances which are needed by the body and distributing them to the various organs of the body with the greatest possible adjustment to the needs. A host of intelligent chemists could not work out in years the details of the processes which our abdominal organs carry out in a few hours. And yet the physiologist does not refer them to any abdominal soul, or to any planning intelligence: he starts with the conviction that all these useful performances result from merely physiological cell activities. The usefulness and apparently intelligent fitness of the motor reactions in the infusor and the frog and the man do not, therefore, demand the reference to intelligence either, as long as we remain loyal to the physiologist's standpoint. On the contrary, it is this usefulness, as we saw, which becomes the vehicle for a biological explanation.

In the lowest forms the whole surface may still receive all the stimuli which are essential, and the whole body may still contract and expand. Then differentiation leads to an increased sensitiveness of particular regions to special outside excitements, that is, it leads to the formation of sense organs. Correspondingly, special parts of the bodily substance acquire ability for isolated contraction; that is, they become muscles. As soon as sense organs and muscles are developing, the transmission of the excitement from the one to the other must become localized too. Special paths of least resistance form themselves; they are the nerves. The next step is a more complex interrelation

between the various organs of stimulation and the various muscles. One sense stimulus must be able to produce the contraction of many muscles, or many sense stimuli must be able to coöperate toward the contraction of one particular muscle. This is possible only when the nerves form a network. Such an interconnection allows the coöperation of many parts, but the responses are still the reactions to the immediate stimuli.

As soon as evolution has reached a stage of higher complexity, the animal would be unable to protect itself against dangers and to secure its food and its safety, if a further variation were not developed by natural selection. The movements must not only be adapted to the impressions of the moment, but also to the earlier ones. The action then becomes a response to the present experiences together with the preceding ones. All that is necessary for this great further step is that certain parts of that network of nerves which intermediates between surface and muscle acquire a new trait. They must become able to sum up excitements; the first impression must leave a certain after-effect which unites with the later excitements in the control of the resulting reactions. The animal can now adjust its movements to objects which are not immediately in the sphere of its senses, but which previously were connected with the present surroundings. Those parts of the nervous system which especially regulate the coöperation of peripheral functions and stir up the after-effects of preceding stimuli become anatomically distinct nervous centers.

As soon as we reach the higher animals, this system of centers is developed to a high complexity. Protected by the skull and the vertebræ, the clusters of central organs are grouped as brain and spinal cord. Sensory nerves lead to them from the higher sense organs and from every part of the skin, and motor nerves lead from the central nervous system to every muscle. The interrelations be-

tween the various regions in spinal cord and brain become richer and richer from fish to reptiles and amphibians, to birds and mammals. The immediate arcs between the sensory and motor centers become more and more subordinated to the superstructure, the cerebral hemispheres, which reach their fullest development in the higher mammals. Only through their centers the most complex correlations of the lower centers can be secured. The situation becomes still more complex by the fact that not only the surface but also the inner organs send their messages to the brain, and that the centrifugal impulses do not go merely to the outer muscles, but also to the glands and blood vessels and inner organs. But even where this nervous differentiation has reached its greatest manifoldness, we find as its only function this perfectly useful adjustment of the reaction to the physical-chemical conditions of the surroundings, and as it remains useful at every stage, the intermediating brain action appears entirely explainable.

The Biological Aspect of Man.—Fundamentally no new principle sets in when nature proceeds from the highest animals to the human beings. Three features are especially characteristic of the new step. They have long been prepared in the reactions of the animals. First man *develops the tool*. It is a condition for an extreme advance in achievement, and yet the change is exactly in the direction in which the development from the infusor to the monkey went on. It is a new means for reacting usefully on the surrounding world. It is simply an extension of that arc from sense organ through brain to muscle. Our eye is sharpened by the telescope and the microscope, our ear receives messages by long distance telephone, our brain is stimulated by cable and newspaper from every place on the globe, our brain connections are disburdened by our libraries, the motor impulses of our brain can produce dynamite explosions, and better than by our muscles we can swim by our steamers, can run by our locomotives,

can fly by our aeroplanes. This enrichment of the reaction apparatus shows one fundamental advantage, on which our whole technical civilization is based: the new additions to the biological arc are detachable. They are not destroyed by the death of the individual. In the whole complexity which they have reached during the lifetime of the organism they can be handed over to the descendants. The work of the generations can be cumulated in them. But the rôle of the central nervous system remains unchanged; from a biological point of view the brain which receives the stimuli from the remotest corners of the earth and which can produce effects that may last through thousands of years, remains the automatic transmitter between the centripetal and the centrifugal excitements.

Secondly, one of the motor products is especially significant, the air waves which the vocal cords produce as means of communication. *The language of man* is preceded by the sounds which the animals produce, just as the technic of man is preceded by the nest of the bird and even by the house of the snail. The biologist has no difficulty in understanding the development of this apparatus which functions by producing sounds as they attract or warn or threaten other animals in a most useful way. Its further differentiation in the rise of man remains entirely open to such a biological explanation. Every step forward had its distinct advantage for the preservation of the social group in the struggle for existence. The sound which the one ejects and the other receives as ear stimulus becomes a substitute for the objects of the surroundings. The more the language becomes differentiated, the larger is the circle of things which one individual can bring into the sphere of others by words just as if they were present to sense. Moreover not only the things, but their mutual relations are replaced by sounds and the man who hears the spoken language is thus stimulated by a much larger part of the world than ever could reach him through actual

contact. Any relations past and future can now be the stimuli which lead the brain to action, and the direct contact is replaced by the signs of the written or printed word. Each speaking individual lives in a world which is incomparably richer than that in which the individuals of the biologically lower stage moved, but it is again only a new advance in the same direction of evolution. Besides the development of tool and language, and in close dependence upon them, we find, thirdly, *the use of all forms of coöperation*. Animal life anticipates this method of adjustment to external conditions, especially the joint work of the family. But only with man does the great economic exchange set in. It is again only the enrichment of the functions of the physiological arc. At the stage of the human differentiation the single individual is no longer able to receive all the sensory stimuli, to produce all the motor reactions and to make all the connections between the sensory and the motor systems which would be needed for his personal protection. A social differentiation begins by which the one produces reactions not only to himself but to many others, and is in large degree relieved by the reactions which others perform for him. From this new principle the market arises, the trades and professions develop, life becomes more and more complicated; and yet every individual activity in service of such coöperation still remains the most useable reaction of the organism to the total set of conditions. The development reaches its climax in those activities which, seen from an inner point of view, appear directly opposed to the principle of selfpreservation, namely altruistic actions. The moral life is the unselfish life: actions are performed which serve not the actor but another individual. Yet, from a biological viewpoint the action appears different. Each individual's preservation is first of all bound up with the welfare of the whole to which he belongs. A group of mutually helpful

organisms will survive, while a group of individuals which fight one another must be weak and without chances.

Hence the biologist, however one-sided his standpoint must be, is perfectly justified in claiming that *the whole system of human brain processes is biologically useful and therefore explainable through merely physical causes like all the other functions of the organism*. The difficulties which he finds in his way, the unsolved detailed problems of inheritance, of growth and so on refer to the function of the blood-vessels or of the digestive tract as much as to that of the nervous system. But he does not need any mental interference in the latter more than in that of the former. He can take it for granted that even the wisest word and the noblest action may be consistently understood as a physical-chemical effect of strictly physiological causes. If all the atomistic dispositions of the brain and all the influences on the brain with all their after-effects were known, the acquaintance with the present sense stimuli would be sufficient to determine what motor response would go on in the individual. It is no counter-argument that the stimuli may be very similar, and yet the effects extremely different. In a telegram which we receive the change of a single letter may change all the reactions of greatest joy into those of deepest distress. But that is not surprising, as all the earlier experiences of the brain have created a setting in which the one or the other optical word sign moves entirely different physiological levers. A minimum dose of arsenic may also appear extremely similar to a dose of sugar; and yet as soon as it is swallowed, it affects millions of cells in the organism by its destructive power.

We now have the foundations for a truly psychophysical system. We have recognized that the causal aspect of mental life requires us to treat all the mental elements as accompaniments of brain processes, and all their connections as results of physiologically necessary causal proc-

cases. This would be a hopeless undertaking, if it were by principle impossible to explain all the brain actions in human life from mere physical causes. But now we have seen that as parts of the arc between sense organ and muscle they are under all circumstances useful in their normal functioning and therefore physically explainable. The task before us is to understand the psychical elements and their coming and going as parallel to this closed chain of physical events. Every psychical element and every psychical law must accordingly be understood as related to some part or some process in the biological arc, either to its centripetal or its central or its centrifugal segment. This biological view of psychophysical action, which is indispensable for causal psychology, must control the study of every single feature. The usefulness of the processes is the condition for their development.

CHAPTER VII

STIMULATION

The Psychological Elements.—The chain of processes from the stimulation of the sense organ to the movement of the muscles, which has appeared to us so far as a merely physical activity of the nervous system, must now be illuminated by the mental events which accompany it. We naturally begin with those which form the initial part in this life process of organic adjustment. No impulse to adapted action is possible unless as a starting point the outer world impresses the brain. Physiologically, our question would be only: what external processes have the power to stimulate the central nervous system? We should then trace the impressions which the light rays and the sounds and the temperatures and the pressures and the odors may exert on the brain elements when they are transmitted through sense organs. But for us the problem is now a psychophysical one: what mental contents accompany the brain processes that result from such external stimulation? As soon as this psychological side is emphasized, the analysis of the mental impressions must be the starting point. We find in ourselves experiences which correspond to the stimulations from without. We must resolve these inner states. We ask accordingly which elements we can discriminate when we see and hear and touch the world around us.

Only one way is open to us. We must turn our attention to the impressions which we receive and try to discriminate in them all noticeable differences. If we taste some ice cream, we may feel the impression as a unit, but if we

egin to analyze that perceptive material, we easily discriminate the coldness from the sweetness and the mere touch impression from either. And if we are aiding this selfobservation by experiment, our separation of elements may go still further. Experimenting does not necessarily require the use of instruments. We perform an experiment if we observe the taste of ice cream while we close the passages of our nose. Then we find that, under these artificial conditions, the sweet loses its chocolate flavor. That is, we discover that the impression which appeared to be a mere taste also contained elements of smell. We have accordingly no elementary content before us when we experience the impression of chocolate ice cream, because we can resolve it into simpler factors, into the taste sensation of sweet and the smell sensation of flavor and the temperature sensation of cold and the tactual sensation of smoothness; and if we went on experimentally, we should be able to show that even this impression of smoothness can be resolved into still simpler elements. To enumerate all the mental indivisible parts which can be discovered in our outer impressions demands an introspection with all the aids which the laboratory can furnish. The apparently simple stimuli like pressure on the skin or contact often demand the most complicated experimental investigations to discover the mental elements in their perception.

If the *elements of our perceptions are called sensations*, the list of our sensations is long, and yet rather short compared with the multitude of objects which we perceive. On the one hand the same elements may be combined in numberless forms, just as the few letters of the alphabet are combined into the works of Shakespeare. On the other hand the technical devices of civilization may transform the stimuli of outer things to bring them into the limited compass of our sensations. To protect ourselves we must react to the dangerous bacilli of diphtheria and tuberculosis and we must discriminate the tenth of a degree of

blood temperature and the smallest poisonous addition to our food. Our naked senses are not sufficient. We cannot see the dangerous tubercle bacillus as we see the dangerous snake, nor can we discriminate by our senses a tenth of a degree of temperature or smell or taste a milligram of arsenic. All this is done by those detachable appendages to our senses. We see by the microscope, we measure with the thermometer, we examine the chemical reactions. Biologically, the sensory apparatus is by these technical methods wonderfully enriched. The circle of objects which stimulates our psychophysical system and becomes the starting point for reactions, is gigantically expanded, but the number of psychophysical elements is not increased by this change. No attachment to the eye can bring to the brain any visual elements which are not contained in the natural impressions without the technical help. On the contrary, the devices of technic may easily lead to a neglect of sense discriminations by which the number of sensation differences becomes decreased. We civilized men may be less aware of difference of temperature sensations than the primitive people since we do not give attention to them and rely on the visual impressions which the thermometer furnishes. We must now study the different groups of sensations, and may begin with the most complex, the sensations of light.

a. OPTICAL STIMULATION

The System of Light Sensations.—Looking out into the street we see objects near and far, to the right and to the left, large and small, and in all possible forms. Moreover we see the objects changing their forms and positions. We see a man walking, that is, his passing through different places in succeeding times, as directly as we see the color of his red necktie. But when it comes to enumerating the elements, we recognize that all the space traits involve re-

lations and are not elementary as that red color impression is. If we seek the visual elements, we are not interested whether the objects are round or triangular and in what rhythm they succeeded one another. We consider simply the elementary material out of which the mental impressions are formed. In doing so we single out a side of the actual experience which never exists alone. Even the shortest light impression has a time value for us, and the smallest color point has a space value. But we want to abstract at first from these aspects as much as we disregard the fact that the color has an element of pleasantness or unpleasantness for us, or that it forces itself on our attention.

The classification which lies nearest is that which separates the *colors* from the *colorless light sensations*. To gain a quick survey of both regions, we may group all the colorless sensations in one series from white through the light grays and dark grays down to black. We may proceed similarly with the colors. In the rainbow series of the spectrum we recognize at once the red, orange, yellow, blue, green, violet. But if a long spectrum is carefully examined and we study the smallest differences of neighboring spots which we can discriminate, the well-trained eye distinguishes between the extreme red and the extreme violet about one hundred and fifty small steps. There are all the greenish yellows and yellowish greens, and bluish greens and greenish blues, and so on. If this were all, we should have between red and violet one long series of many colors, just as we had between white and black one long series of grays, in both cases each sensation most similar to its neighbor and separated by a just perceivable difference.

But the two cases, after all, are not alike. If we go from white to black, we feel that every point between them, every gray, has a certain similarity to both, and the further we go away from white and the more we approach the black, the less our gray appears whitish and the more blackish. If we pass from red to violet, the experience is

quite different. At first we come from red through orange red to orange yellow, to golden yellow, to yellow, and have along the whole way the distinct impression of a decreasing similarity to the red and an increasing similarity to the yellow. The yellow itself no longer reminds us of the red. As soon as we pass the yellow, we come into a series in which each color tone has similarity to both yellow and green, changing toward greenishness the further we remove from yellow. At green again a fundamental change appears. Each following color becomes less greenish and more bluish until we reach blue. And now the turn comes for the last time. Toward the end of the spectrum the colors become less and less bluish and more and more reddish. If we add the various hues of purple to the violet, we can pass directly from the blue through violet without any break to the red sensation with which the spectrum began. In the white gray black series we had only two end points, black and white. Everything between them is characterized by similarity to both. But we see that in the color series we have four such points of reference, red, yellow, green and blue, and every possible color impression gets its color value through its similarity to two of these four points.

How ought we to interpret this color series. If we look at a series of uniform colored papers, a greenish blue or a reddish blue, that is violet, or a reddish yellow, that is orange, appear to us, each taken by itself, just as simple as a yellow or a blue or a green. If we emphasize this fact, we should have to say that these one hundred and fifty color sensations are all independent ultimate elements. This is often maintained. But after all this ignores the significant fact from which we started, namely that if we pass along through the spectrum series, we can feel every hue between red and yellow as being related to those two end points, and the same of the colors between yellow and green, and green and blue, and blue and red. What else

does this similarity to the two colors mean but that under the favorable conditions of such an experiment we become aware of the reddishness and yellowishness in the orange, which we are accustomed to ignore, if we look at the orange alone. There is some real reddishness and some real bluishness in the violet sensation.

To be sure, those two elements in it are not mixed like salt and pepper. At every physical violet point both the red and the blue are found. But we are not speaking here of physical stimuli; we are speaking of the mental content and, if two mental contents become mixed, we cannot expect anything but a new mental content in which the two elements which enter lose their independent character, fuse into a unit, and yet give to the new product similarity to both of the two. We have a right, accordingly, to say that all those one hundred and fifty color differences result from the combination of the mental elements *red*, *yellow*, *green* and *blue*. The achromatic series then demands the same interpretation. Every gray is a mixing and blending of the *white* sensation and the *black* sensation.

Saturation and Brightness.—A glance at the world teaches us that these pure spectral colors and the series of grays are only a small part of our impressions. Hardly any colored objects in a room show those rich and saturated colors which the spectrum presents. Our blotting paper may be green, but it is a dull and unsaturated green in which the greenishness does not appear with that impressiveness in which it stood out in the spectrum; and the brown oak furniture is colored, and yet its color has found no place in that rainbow series. Nor did we have there any pink or olive or salmon or lilac color in our series of a hundred and fifty hues. Yet here too we quickly discover a simple systematic order, if we study what results when the pure color sensations are mixing and fusing with colorless sensations. As white and black are blending in gray,



white and red are blending in pink, and white and violet in lilac, and black and yellow in brown.

Here, too, the question of simplicity arises. The pink in itself appears an entirely simple, unified impression. But if we look over that whole long series from pure red to pure white, each step a little less reddish, and a little more whitish, then we recognize that every pink contains a reddish and a whitish element. Every single colorless sensation from white through gray to black can fuse with every single color sensation and can be mixed with it in any proportion. Our blotting paper green is green fusing with a rather dark gray, and the blotting papers vary between a rather saturated green with little gray in it to an almost grayish paper with very little green in it. If we were seeking a graphic symbol, we could think of every one of the one hundred and fifty hues as the apex of a triangle of which the base is a line from white to black, containing all the different shades of gray which we can discern. In these triangles every point of the base can be connected by a straight line with the apex, and each of these lines would represent the series of different mixtures between the color sensation and a particular gray sensation, that is, the color of the apex in all degrees of saturation. We are accustomed to call those which lie on the whitish side of the triangle the tints and those on the blackish side of the triangle the shades.

Everyone of these triangles would contain, accordingly, several hundred different combinations of the hue with all kinds of gray in all proportions. On the other hand evidently no combination in one triangle could reappear in any of the other triangles. The psychologists, therefore, recognize *thirty to forty thousand different color impressions*. Yet it is clear that as everyone of those hues was a blending of the four colors, red, yellow, green, blue, and every gray a blending of the two impressions, white and black, and every tint and shade a blending of one of the

colors with one of the grays, this bewildering manifoldness can be brought down to a system of combinations of six light sensations. In order to determine a particular color impression, we must indicate which of the six impressions are present and with what intensity they enter into the combination.

This whole system of light impressions can be looked on from another point of view. We spoke of the colorless series as one which leads from white through gray to black, and we treated those two end points as two qualities like red and blue. But in ordinary life we are inclined to take a different point of view. The black is *darkness* to us, the absence of light sensations, and the series from black through gray to white presents an increasing *brightness*. If the sun shines on white paper and then we close the shutters of the windows, the white becomes gray, and the more we exclude the light the more blackish it becomes; and yet it is more natural to say, not that black is mixed in, but that it becomes darker and darker. We all have a certain difficulty in watching our real light sensations, because we attach the names of the objects to the light and believe that the sensation is still present as long as we know that the object is before us. We call a blackboard black, even if the sun shines on it so fully that we see practically a rather light gray; and we call our paper white in spite of a deep shadow on it by which we actually see a dark gray. But if we emancipate ourselves from this thought of the objects, we recognize that under all circumstances the series from white to black means the series from greatest brightness to deepest darkness.

As soon as we study this brightness aspect of our light impressions, the world of colors appears to us also bright and dark. The yellow is brighter than the blue, and the blue tints and shades can go through any degree of brightness. If the sun breaks through the clouds, every color in our room becomes brighter, and if twilight falls, every

color becomes darker. We can easily determine the degree of brightness by comparing the color with various grays. A color patch on the background of a blackish gray may appear bright, on the background of a whitish gray it may appear dark, and in changing the gray we can find the gray background on which it appears neither brighter nor darker, but equally bright. We can thus refer the brightness of every color impression to an objective scale of gray sensations. From this point of view we must be able to arrange the color sensations also according to the different degrees of brightness. It is evident that this is not a really new element in our impressions, but only a new angle of comparison suggested by particular interests.

The Visual Stimuli.—Our next question must be how these visual sensations which we have mustered are related to the visual stimuli of the surroundings. The world is visible in so far as it sends out or reflects ether waves of a particular length. The long ether waves which carry the wireless messages stand in no relation to vision. But if they become as short as 690 millionths of a millimeter, they produce in our nervous system an excitement which is accompanied by the sensation of red, and if the waves become shorter and shorter, the psychocerebral processes pass through those one hundred and fifty hues to violet, where the rays are only 390 millionths of a millimeter long. If the ether waves become still shorter, they cannot reach the optical centers and are invisible, in spite of their chemical effects. While the color hue corresponds to the length of the wave, the saturation corresponds to the simplicity of the waves. The more complex the wave becomes, that is, the more wave rhythms are combined in the light rays, the more uncolored light sensation is added to the color. When all possible rays of the sunlight are mixed, the pure white and gray result. The brightness, finally, depends upon the intensity of the light, that is the height of the wave.

As to the correlation between the brightness and the in-

tensity of the light rays, one fact stands in the foreground. The just perceivable difference between two sensation brightnesses does not depend upon the absolute but upon the relative difference of the light intensities. The same amount of candle-power which makes a gray just noticeably lighter, when added to a weak light, would not produce any brightening, if it were added to a stronger light. The five times stronger illumination demands a five times greater addition in order to produce on the psychical side the same just noticeable difference. The addition which is needed must stand in the relation of 1 to 120. The light of a wax candle throws clear shadows in a dark room; that is, we see distinctly the light difference between the fields on which its light falls and those which remain without. But as soon as the sunlight floods into the room, those candle shadows become invisible. Yet the absolute difference between the places which are lighted by the candle and the not lighted neighboring places remains the same. We do not notice this difference now, because the much stronger sunlight has added to both so much light intensity that the relation between them is entirely changed. For the same reasons we do not see the stars by daylight.

This observation that the brightness of our light sensations shows *equal differences* when the compared stimuli are in *equal relations* has an especial significance, because this principle can be found in all other sense regions too. It surely holds for tones and noises, for pressure sensations and movement sensations, and probably for taste sensations. *Everywhere we find that the equal difference of the intensity of sensations depends upon equal relations of the corresponding stimuli.* But the significance of this law lies most of all in its historical importance. It was the germ from which modern experimental psychology developed. Based on observations of Weber and systematically developed by Fechner in the middle of the last century, it

appeared as the first case in which psychical experiences could be brought into a definite relation to exactly measurable physical facts. The vista of a psychology similar to the measuring natural sciences was opened by this discovery. As it was the first law which connected the psychical and the physical facts in the terms of exact measurement, historical respect has even left to it the somewhat pompous name of the *psychophysical law*.

The apparently simple relation between sensations and physical stimuli indicates only the typical conditions. It is true we can produce all color sensations by changing the wave lengths, all degrees of saturation by changing the mixture of waves, and all degrees of brightness by changing the height of the waves. But this does not exclude changes occurring in all three directions under still other conditions. The following facts are especially noteworthy: First, we may go from a saturated color to mere gray not only by mixing it with other colors, but by decreasing its intensity. All colors appear gray in twilight. Or we may get gray by mixing only two lights of particular wave lengths, the so-called *complementary* colors, like yellow and blue or purplish-red and blue-green. Moreover we may see gray, if we have pure light of one length only, if it is far aside from the point which we fixate.

On the other hand we may produce a special color hue, if light rays of that particular wave length do not stimulate our nervous system at all, but if lights of greater and less length are mixed. We can see orange by being stimulated by simple waves, but we can also see it under the influence of red and yellow together. Furthermore, we may see a color in spite of the complete mixture of all rays, if the field is surrounded by color. It is the effect of color *contrast*. A little piece of gray paper appears blue on a yellow ground, yellow on a blue ground, red on a bluish-green ground and bluish-green on a red ground. And we may see a color, too, if the complementary color preceded:

the color *after-image*. If we look at the purplish sinking sun, and then at a white wall, we see greenish balls on the white ground. The relations between the physical light rays and the psychocerebral sensations of light are thus after all very complicated. In order to understand them, we are obliged to give attention to the apparatus which intermediates between the rays of the outer world and the brain processes with their sensations.

The Eye.—If we consider the construction of the human eye, we must not forget that the evident biological aim of this instrument is not only to bring to the brain notice of the light changes in the outer world in general, but to separate the light stimulations from hundreds of thousands of points in the outer world. The brain must adjust itself to the distribution of colors and lights in the whole space around us and in everyone of those smallest spots we must be able to recognize all the changes of quality, intensity and mixture of light. We are not engaged here in the analysis of space perception, but in order to understand the structure of the eye, this function of the separation of the messages from many single points cannot be disregarded. Thus the task of the eye cannot be fulfilled by having only one apparatus which is sensitive to the changes of light rays, but requires hundreds of thousands of such end organs. They are of two types, the so called *rods* and *cones*. The shorter, the cones, are bottle-shaped; the longer, the rods, are straight, standing so near together that a half million of them form the cup-like retina which is the background of the eye. The cones alone fill the center, the fixation point, the region of sharpest seeing, while the rods increase in number with the distance from the center.

Each of these hundreds of thousands of rods and cones is in connection with a nerve fiber, and all these turn toward one exit, leaving the retina in one big cable at the nasal side of the eye. These two cables from the right and left eye exchange half their fibers on the way to the brain. Those which come from the right side of the right retina go together with those from the right side of the left retina toward the right side of the brain,

and correspondingly those from the two left sides of the retinae to the left side of the brain. After passing several middle stations, they finally reach the rear part of the brain, the occipital lobes of the hemisphere. If a hemorrhage destroys these occipital parts on the right side of the brain, the right halves of both eyes become blind.

The retina is kept functioning by a network of blood-vessels, the choroid. In order that the light rays may reach every part of this system of nerve end organs, this hollow cup, the retina and choroid, is filled with a gelatinous substance through which the light passes. In order to regulate the amount of light and thus to protect the sensitive end organs against overstimulation, the front is covered by a shutter with an opening, the pupil. This shutter, the iris, which according to its pigment looks green or brown, and if pigment is lacking looks blue, can contract or dilate. In full sunlight the pupil is so small that it admits only the twentieth part of the light which would pass in if the pupil were as wide as it is in twilight. This whole system is covered by a tough membrane, the white sclerotic. Its front part is again translucent to light; this is the cornea.

Yet these parts would be insufficient to produce an image, that is to secure the stimulation of one rod or cone only by one light point in the outer world. The rays of light which come from one light point would flood through the pupil and reach hundreds of thousands of rods and cones. In addition a *lens* is needed by which the rays diverging from one light point of the outer world will converge toward one point in the retina. Such a lens is fixed in the front part of the eye, immediately behind the iris. If it were a rigid lens like that of the photographer, a sharp image could be secured only from objects which lie at a particular distance from the eye. The photographer brings his lens nearer to or further from the photographic plate, if he wants sharp images of objects at different distances. In the eye the lens does not change its distance from the retina, but its curvature. The refracting power of the lens is in this way increased when the objects come nearer. All blurring can thus be avoided.

The simplest proof that the rods and cones are really the visual elements by which the ether waves are transformed into

the nerve excitements, lies in the fact that the region where the fibers turn into the cable of the optical nerve, and where no rods and cones exist, is blind. The anatomical difference of structure suggests that cones and rods have different functions. Only the cones serve both for the seeing of colors and of colorless light, while the rods respond to colored light and to mixed light alike by an excitement which leads to colorless sensations. On the other hand the rods are, in the eye adapted to darkness, able to react on very faint light, which is too weak to stir up the cones. Hence in late twilight we no longer discriminate by the fixation point, which contains cones only. For these reasons it also follows that the peripheral regions of the retina lack all color vision. A colored object moved out far from the fixation point must throw its lights on regions almost without cones; it appears simply gray. Between the central regions, however, in which all colors are visible and the peripheral ones, where no color is seen, we find a zone of the retina in which red and green are lacking, but yellow and blue are effective. It is well known that about two per cent. of all men possess a retina which functions also in its central part like this. They are colorblind. They cannot recognize red and green, and everything seems to them composed of yellow, blue, white and black.

If we are to account for this difference between the central region where all colors are seen and the middle zone in which blue and yellow alone are visible, we cannot refer to any anatomical differences like those between cones and rods. There must be differences in the cones themselves, but these differences are not visible under the microscope. We are therefore confined to theories about their *chemical* constitution. We must consider it probable that the cones contain various chemical substances, each of which responds to ether waves of a certain length. The cones in the middle zone, for instance, perhaps contain only two such substances, one of which becomes excited by relatively long waves, producing in the brain the excitement which is accompanied by the yellow sensation, the other excited by relatively short waves, producing the blue sensation.

But the facts would then at once suggest a further development of the theory. We know that blue and yellow mixed give

gray. We might expect therefore that these two substances are only differentiations of the substance in the rods, so that, when both substances are excited at the same time, the same process results which arises in the rods from every kind of light wave. In the cones of the central region the chemical substances must have become still further differentiated. Substances which respond to ether waves from the red and the green part of the spectrum are developed, but if all four substances are working together, again we get the excitation which leads to the colorless gray sensation. A number of such chemical theories have been proposed. We cannot discuss their merits and their shortcomings here. They must be measured by the success with which they explain the facts of color mixing, of color after-images, of color contrasts, of adaptation to color and so on.

The *biological* import of all these details of optical stimulation is evident. It is essential for the individual that he adjust his actions to the objects of his surroundings, not only with regard to the manifoldness of their forms, which colorless vision would impress on him, but also with regard to their richness of coloring. Yet it would be bewildering if everything which entered his sphere stimulated his brain with equal completeness. His reactions must be focused, and therefore his vision too must be most differentiated in the center of the field. The outlying objects must form only a general background, indicating where changes are going on. For this purpose it is advantageous to the psychocerebral mechanism if the side parts of the retina are widely expanded, but attuned only to colorless impressions. It is no less useful for the individual that neighboring fields produce contrast effects, as by this the objects stand out from one another. Through the mechanism for color adaptation, the brain becomes independent of chance illumination, and can thus adjust itself correctly to the world of things whatever colored light may fall on it. By the working of the psychophysical law the mind can recognize the objects of the surroundings more easily. If it did not hold, every cloud before the sun would change the face of the things around us. Differences which we should notice in strong light would be swept away by the weaker illumination.

b. AUDITORY STIMULATION

The System of Sound Sensations.—As in the case of vision, the study of the psychophysical processes in the world of sound, too, may be approached directly from the side of consciousness. The biologist would simply ask on what sounds of the outer world the organism reacts, judging from the outer behavior the cerebral effectiveness of the stimuli. The psychologist analyzes the inner experience first and then correlates it to the physical and physiological processes. The world of sounds to which the human mind adjusts itself evidently differs from that of the animals much more than the world of human vision from that on which animals react. Man and beast alike must regulate their actions with reference to the visible things around them, and it is only an incidental feature for most men that a fragment of that visible world consists of writing and printing, that is of symbols for actual things. The hearing of man, on the other hand, is rather little concerned with the sounds and noises which the things themselves produce and which are essential for the animal. The sounds which most often control the reactions of man are the sounds of speech which merely point to objects.

Among men, however, it seems almost as if the audible world of the psychologist is of a particular order, inasmuch as he is accustomed to give even to this most important part in the realm of sound, to speech, no more attention than to the noises of the surrounding things, and instead to concentrate all his interests on the tones of music. Yet this is not by chance. *The tones can easily be brought into clear and definite series like the color sensations*; nothing similar can be hoped for the host of noises. A simple grouping such as we found for the colorless light sensations is impossible for the toneless sound sensations. Moreover the only promising approach to a better understanding of the noises comes through the study of the tones, and the psy-

chologist is therefore justified in studying the system of tone sensations first of all.

Yet it would be onesided to think of tones only in reference to music. The demand for a biological interpretation must warn us against this. The musical use of tones evidently has no significance for the conservation of life. The ability to listen to a symphony does not help in the struggle for existence. Music is the only art which makes use of a material that has no bearing on our practical work. In the development of the animal race nature cannot have built up the psychophysical mechanism of tone hearing in order that man may hear the richness of sounds from musical instruments. The tones as elements of music are thus a psychophysical by-product, but there are tone elements in most of the noises, and the vowels of our language are tone combinations, while only the consonants are tones and noises.

If we try to bring order into the tones, we recognize easily three different directions in which the impression may vary. A singing voice sounds different from a whistle or from a violin, and these different from a trumpet or from a piano or from a bell or from a flute or from an organ pipe. This variation is technically called *timbre*. Even timbre, on the other hand, can be varied in the direction of lower and higher tones. If we pass over the keys of a piano from the left to the right, the specific piano timbre remains unchanged, but the tones pass from low to high. The low tone sensations appear massive, full, heavy, and are readily inclined to be perceived as expansive, while the high tones appear thin, agile, light. The variation in this direction is called *pitch*. Finally each tone may change from strong to faint, from fortissimo to pianissimo.

This threefold character of the change naturally suggests a comparison with the three dimensions of the visual sensations. If we consider only the psychological aspect it would seem most natural to treat the differences

timbre as the really fundamental differences of tones and to compare them, accordingly, with the variety of colors. The orchestra is a rainbow of sounds. The multitude of instrumental differences is as primary as the multitude of colors. The brightness difference from the darkest gray to the lightest then subjectively corresponds to the pitch difference from the lowest tone to the highest, and the strength of the fully saturated color, decreasing to the point where the color tone disappears, corresponds to the transition from the strong tone to the feeble. In practical life we work with such classifications. If we hear a single tone, we do not give our attention to its particular pitch. Very few persons, indeed, have the ability to recognize absolute pitch. But we do say it is a bell that rings or the sound of a voice or a trumpet tone or a whistle. The psychologist, however, prefers a less natural grouping of the three factors. He considers the pitch as fundamental, and compares the changes of pitch with the changes of color. In doing so he is influenced essentially not by the inner experience, but by the relation of the tones to the physical stimuli.

The Auditory Stimuli.—How can we correlate this three-dimensional system of tones to the sound excitement of the outer world? The normal sources of sound are air waves. The audible limits are about 20 vibrations for the lowest tones, about 50,000 for the highest. The tones of the piano, to be sure, lie within the much narrower limits of 30 and about 4,000. The just discriminable differences of pitch are smallest in the middle regions of musical hearing. An increase of one-fifth of a vibration can there be discriminated by a well-trained ear. In the region of the highest tones differences of several hundred vibrations are needed to make two neighboring tones distinguishable. Nearly 10,000 steps may be discriminated between the lowest and the highest tones by a good ear. This long scale of tones of different pitch is evidently not the

scale of music. In the auditory pitch series, every tone finds a place when it shows a difference from its neighbors. In the musical pitch series only a limited number of specially selected tone sensations are accepted. The physical principle of this selection is the simple arithmetical relation of the tone waves. The octave is characterized by relation of 1 to 2, the duodecim 1 to 3, the double octave 1 to 4, the fifth 2 to 3, the third 4 to 5, the fourth 3 to 4 and so on.

This description of the tones used in music is evidently physical and not psychological. How can we select the most valuable tones from the audible multitude by psychical means? Of course, we might refer to the pleasure which results from their sounding together, but this is an effect produced by musical tones, not a characterization of the tones themselves. Here the conception of fusion offers itself. We saw that red and blue fuse in the violet, red and yellow in the orange, and green in the blue-green, with the result that each entering color loses to some degree its independence and blends with the other color that it is difficult to recognize the elements in the combination. Only by comparing them with independent colors is their presence in the mixture felt.

The tones of different pitch show a very different tendency to fuse with one another when they are together in our ear. Most of the audible tones interfere with one another or remain entirely separated, but others more or less fuse. The highest degree of fusion characterizes the octave. If an untrained observer hears two tones in the relation of 1 to 2, he is generally unable to recognize them as two tones at all. The two tones blend completely into one. Next to it comes the double octave, the fifth, then the third, with much smaller tendency to fusion, the fourth and the sixth. This fusion is strictly a mental experience and it is indeed a sufficient condition for choosing a limited number of tones out of the tone series of audible sensations. Instruments like the organ or the piano are so built that they play other tones but those which subjectively can be brought into combinations of fusion, and which physically show the same

relations in the number of vibrations, can be produced. In the string instruments the whole scale of audible tones can be played, but the fingers which shorten the strings by pressing them down at definite points secure vibrations in those exact relations. The singer creates that same effect by exact contractions of the muscles in the larynx. While the tones in the simplest relations fuse, tones which show only a small difference in the number of vibrations cannot sound together without a disturbing interference. If a tone of 500 vibrations is given together with one of 503, we hear three times in the second a swelling and sinking which is felt as an interruption; the so called beats. If their number increases, they give to the tones something rough; the beautiful smoothness of the tones is gone.

The strength of the tone sensations corresponds to the amplitude of the air waves. The psychophysical law, which we found valid for light intensities, holds for tone intensities, too: the just perceivable differences of the sensations depend upon equal relations of the stimuli. A chorus of forty voices may need the adding of ten singers in order that the sound appear stronger. But for four voices, it is enough to have a fifth man, and a mighty chorus of four hundred would need one hundred more for the difference to be felt.

The relation of timbre to the physical waves is more complicated. That which gives character to our musical instruments cannot be, like the pitch and strength of the tone, connected with the length or height of the single waves. It always depends upon the combination of different waves. We saw that musical intervals exist between physical tones which stand in simple arithmetical relations. Musical instruments are physical structures which never produce one physical tone alone, but always a combination of several such tones in simple arithmetical relations. The essential condition is only that these additional tones which have two times, three times, four times, five times and so on, more vibrations than the lowest tone be much weaker than

this tone with the smallest number of vibrations. If it were otherwise, if we should hear, for instance, a tone of one hundred vibrations and with equal strength that of two hundred, three hundred and four hundred, we should really perceive a manifoldness of tones, however much they might fuse. It would be a musical chord. But if the tone of one hundred vibrations is strong, while those others are weak, our immediate impression is not that of a manifoldness of tones combined in a chord, but that of one tone in a particular timbre. The mental effect of these weaker vibrations is not the impression of coördinated tones, but only that well-known shading of the lowest tone which gives the instrumental character.

The best approach to these overtones is through the use of resonators, hollow bodies, which, when they are held before the ear, reënforce a particular overtone so much that it stands out from the combination which forms the timbre. Yet as soon as the tone is strengthened it is no longer the natural instrumental tone. As long as we leave the elements in their natural intensities, we may recognize the parts, but this does not destroy the timbre character of the lowest element of the combination. Subjectively, the significant flavor of an instrumental tone remains, even if we discriminate elements in it, and thus the whole must be acknowledged as a psychological unit, while it is physically a complex combination. It is this complexity of the outer stimulus which makes the psychologist usually unwilling to accept the timbre as a basis for the classification of tones, and leads him to prefer the pitch.

When we speak of combinations of tones, either in chords or in timbre, it would, of course, be a misunderstanding to fancy that the combined tones remain independent air waves. If the sound of a chord comes to us, we do not have some air particles which move in one rhythm and others in a second and again others in a third, but each air particle moves under the influence of all the vibrating

bodies. The waves are combined, as the circles on a pond are combined when two stones are thrown into it. In the cases of the overtones, the sounding string itself combines the various movements. The complexity of such a combination becomes evident, if we think that we can hear a whole symphony through the telephone. The one vibrating telephone diaphragm must vibrate in such a complex rhythm that we can recognize all the various instruments in the orchestra. A combination of tones means, therefore, not a mere summation of simple regular waves, but the formation of complex waves. The characteristic feature is that, as long as we have to do with musical tone combinations, the resulting wave, however complex, remains a *periodical* one; that is, it repeats after a certain time exactly the same form, and the length of that time is given by the vibration of the deepest tone which enters. If the tones of one hundred, two hundred, three hundred and four hundred vibrations are combined in any relative intensity as chord or as timbre, the resulting wave repeats itself after every hundredth of a second. As soon as we no longer have to do with musical tone combinations, that is, if the vibrations which enter into the combination do not stand in a simple arithmetical relation, the physical product is an unperiodical air vibration, and this is the external condition of most of the noises.

All the continuous noises, all roaring and rumbling, rustling and hissing, buzzing and whispering, howling and rasping, consist of such unperiodical air waves. Only the sudden noises, the clicks and snaps and cracks, correspond to single, explosion-like air movements. Many of the noises by which the world tortures us are combinations of such continuous noise elements with successive sudden noise shocks. Not a few noises contain strong tone elements. If a piece of wood falls to the floor, we hear it as a noise only, but it is quite possible to cut a series of pieces of

wood so that, if one after another is thrown to the floor, a distinct melody of tones results.

The Ear.—In the case of vision, when we had discussed the light sensations and the related external stimuli, we turned to the sense organ in order to understand the transition from the ether waves to the psychocerebral excitements. We must now raise the same question concerning the sound sensations and the physical sounds. How are they connected by the actions of the ear? The problem which is to be solved is clear. There must be an apparatus by which the various sound waves produce various nervous excitements. If we take it for granted that the central processes for the different tones are excitements of locally different brain units, we must suppose that every tone of a special pitch reaches a special end organ in the ear and that its excitement is carried in a special nerve fiber to a special cell in the brain. As we saw that we could discriminate ten thousand steps of pitch, ten thousand end organs would have to exist, each of which could pick up the waves of a particular rhythm.

If this were realized, there would be no mechanical difficulty in the second demand which we must raise; namely, that these ten thousand end organs resolve the complex periodic waves into their elements, that is, into all those simple tones which were combined in a chord or in a timbre. We saw that however many simple waves may be superadded, they form together a periodic wave as long as the elements stand in simple arithmetical relations. But the physicist also knows the reverse. *Every periodic wave, however complex, can be understood as a combination of elementary waves which stand in simple relations.* Theoretically, any chord or timbre wave can be resolved, accordingly, into a number of pure tones. The ear must have the analytic power to resolve the complex wave into these elements.

The prevalent view is that all these tasks are fulfilled in the ear by *sympathetic vibration*. If we sing a tone in a room in which a piano is standing, the one piano string which gives the same tone responds by vibrating, while all the other strings remain at rest. Each vibrating body answers in this way to the waves of the surrounding medium, if they correspond to its

own rhythm. If we had a harp of ten thousand strings, each one a little longer and heavier than the preceding, the longest moving in twenty vibrations in the second, the shortest in fifty thousand, every air vibration in the limits of hearing would start the movement of one of these wires. Just such a harp is contained in our inner ear. It is not actually a system of isolated wires, but a continuous, long, narrow membrane. Yet this membrane is held at its longer sides at such a tension that it can work mechanically as if thousands of parallel strips were stretched beside one another. The longest is about half a millimeter, the shortest about the twelfth part.

This suspended membrane must be reached by the sound waves. It is contained in a bone cavity which is formed like a snail shell, a spiral of two and one-half revolutions. The membrane divides this spiral tube into a lower and an upper passageway, which are connected with each other at the top. The whole cavity is filled with liquid. Each of the tubes contains at the bottom a little membranous window. If the one is pushed inward, the water in the whole system must be pressed and must push the other window outward. If the first, the so-called oval window, is brought into vibration, the whole liquid content must take up the rhythm and force itself in waves against the long-stretched membrane, in which the sympathetic vibration of the corresponding string results. The oval window receives its rhythmic movements from a stirrup-formed bone, and this is fastened to other small bones, the hammer and anvil, which lie on the inside of the ear drum.

The air movement, which reaches the ear from without, produces the vibration of the drum membrane, this transmits its movement to those three bones, and the stirrup drums its rhythm on the oval window, which pushes the liquid of the spiral cavity and reaches through it those fibers in the stretched membrane which respond sympathetically to the particular number of vibrations. Each of these fibers is in connection with a special nerve, and they all are joined in the big cable of the acoustic nerve, which leads to the brain and which carries each special fiber to a particular brain cell. The excitement of this brain cell is accompanied by the tone sensation of the special pitch. The complex wave of the chord or the timbre is in this way resolved into

its components. In the case of the noises the excitement is not confined to single strings in the membrane, but whole large parts of the membrane are pushed at the same time, and produce that vague effect in which the single tones are no longer heard.

This whole theory has been attacked at its foundations recently, because it offers difficulties in the explanation of some subtle effects. It seems, especially, not to account well for the difference tones, which the well-trained ear can easily find. Their pitch corresponds to a number of vibrations which is the difference between two objectively given sounds, a low humming tone which is musically of importance. The opponents of the theory that our hearing depends upon the principle of sympathetic vibration are rather inclined to think that the rhythm and complexity of the waves may be carried through the nerves themselves and may produce different qualities of excitements in the same brain center. The various tones would correspond then not to the vibrations of different brain cells, but to the various kinds of function in the same brain unit. There are many practical difficulties in the way of such an idea. We know, for instance, the not infrequent pathological cases in which certain parts of the pitch scale are lacking. We can easily understand that the lowest or the highest or some middle part of the long, stretched membrane might be defective, and this corresponds to anatomical observations, but no other theory can give an account of such disturbances.

Yet the more important argument is theoretical, and it throws light on the whole situation of psychophysical theories. This whole correlation between the mental and the anatomical physiological facts is not an object of discovery, but one of organization. A theory does not fulfill its purpose, if it simply explains a particular group of facts and does not adjust itself to the causal understanding of the totality of mental processes. The mere demand for psychophysical parallelism would, of course, be just as well satisfied if different tones corresponded to different excitements in the same cell, as if they corresponded to the action of locally separated cells. Just as the diaphragm of the telephone can swing with so many variations that a whole orchestra can be heard through the vibrations of the one plate, any one brain cell too may receive a whole symphony. If the

reception of tones alone were involved, the one theory might serve as well as the other.

But if we stand before the final decision, we must look much further. These tones enter into memory processes. We can reproduce a melody in our mind, and we shall soon see that this memory depends upon processes of association and that these associations can easily be understood, if they are explained by the action of nerve fibers which connect the locally different cells, but cannot be understood by a succession of different excitements. The theory of the harp in our ear will thus have to be accepted, unless the association processes too can be put upon an entirely new basis.

c. THE LOWER SENSE STIMULATIONS

Taste.—Taste, smell and touch are grouped as lower senses, compared with sight and hearing, since the world with which they bring us in contact is that of our bodily interests only. Our intellect gets no stimulus through tongue, nose and skin which is comparable to that of words which we read or hear, and even our esthetic satisfaction from odors and tastes can hardly be compared with the enjoyment of true beauty through the visual and audible arts. The flavors of the meal are pleasant, but not beautiful. Yet this lower type of service is surely not unimportant. The attractive taste and smell of the food, the disagreeable smell of that which is impure and poisonous, are strong hygienic regulations of our behavior. It is true that this psychophysical apparatus does not work perfectly. There are poisonous gases which do not smell, and a few poisonous chemicals which taste sweet, and even the alcoholic beverages, pleasant to the taste and smell of not a few, must be classed among the dangerous chemical substances. But on the whole, taste and smell tempt us and warn us in our biological interests, the one adjusted to the solids and liquids, the other to the gases which enter our organism.

The number of distinct elementary taste sensations is certainly very small. The endless variety of perceptions which we may gain by eating and drinking results from the manifoldness of combinations, and in these combinations the smell sensations show much greater richness of differences than those of taste; and superadded are the tactual impressions, the temperature sensations and not least the impressions of our reaction movements in the mouth cavity. If our psychological analysis, especially when aided by exact experimental conditions, singles out the taste elements, *sweet*, *salt*, *sour* and *bitter* remain the ultimate factors. Each of these four sensations can pass through various intensities. The claim that there is a special alkaline and metallic taste probably accredits to taste something which is a blending of taste and smell. The opposite claim that even sour and salt are not real tastes, but that they receive their characteristic content from combinations of taste with tactual and other sensations, seems not tenable either. It is true that salt brings an element of burning, and sour an element of contraction. But they can be recognized as effects of the tastes, not as parts of them, just as the pleasantness or unpleasantness is not itself a real part of the taste. The oily or soft or pricking effect of taste substances must also be separated from the real taste itself. The four taste qualities show a certain inner relation not quite dissimilar to that of the four color sensations. Especially if they are in moderate strength, they blend with one another and fuse in different degrees, and within certain limits they can neutralize one another. Sweet and salt, salt and bitter, sour and salt, sweet and bitter, diminish each other, if they are given in weak solutions. Moreover, similar to light, the taste sensation fades away when the stimulus continues. We become adapted; a weak bitter taste cannot last long. The experiment proves that the adaptation to one taste may strengthen some of the other tastes.

The physical stimulus which leads to the psychocerebral excitation of taste sensations is liquid substance; that is, any solid material must partially be dissolved by the saliva of the mouth in order to excite the end organs of the gustatory nerve. It does not seem possible to give a definite chemical characterization of those stimuli which produce the four tastes. Roughly speaking, the sensation of salt corresponds to those substances which the chemist calls salt, the sweet to the sugar, the sour to the acids, but these names themselves are evidently used in chemistry on the basis of the taste impressions, neglecting the not rare exceptions in which an acid or a salt may appear tasteless or sweet. The sense organs are taste buds which lie in fungiform, foliated and circumvallate papillæ. The nerve endings in those papillæ may all respond only to one single kind of stimulus or to two or to three, to sugar, acid and salt alike; that is, taste bulbs of different function may be combined in a single papilla. The tip of the tongue, the edges of the middle part and the root are the chief taste regions, but it must be added that this is true only of the adult, as children have fully developed taste sense all over the tongue and also in other parts of the mouth cavity. The prevalence of certain taste papillæ in special regions is not without influence on characteristic motions of the face in tasting sweet or bitter substances, and these motions again become so intimately related to the significant feeling tones of the tastes that we can trace the effects in many emotional expressions of the face.

Smell.—As the small number of elementary colors contrasts with the multitude of elementary tones, the quartette of tastes contrasts with the host of smell sensations. Yet while the thousands of tone sensations form one continuous series in which each stands between two others from which it is just perceptibly different, the smell sensations of man appear rather chaotic. They are, anyhow, probably scanty compared with those of some animals. The discrimination of smells by the dog can hardly be understood from the olfactory experience of man, whose erect position makes it biologically less important to depend upon scent.

Nevertheless it is quite possible to form certain groups of the smell sensations of man. All kinds of flower fragrance have a certain similarity, and the odors of tea or vanilla would fall into the same group. They are quite different, for instance, from the odor of the various kinds of fruit or wine, and both again are widely separated from the nauseous odors of decaying matter. Usually nine large groups are acknowledged, and each of them can be further subdivided.

If odors are combined, they can sometimes produce an entirely new impression in which the elements can hardly be recognized. More often a balancing effect results; one smell neutralizes the other, at least for a short time. The most characteristic feature of the situation is the quick adaptation to smell. We cannot keep an uninterrupted smell impression beyond a few minutes. As soon as we become adapted to a strong smell, similar smells are lost also, while others remain unchanged. The stimulus is always vaporous. A direct correlation between the sensation and the atomistic constitution of the odorous substances has not yet been reached. The end organs of the nerve lie in the highest part of the cavity of the nose. They are long thin cells, clustered together in a narrow region, somewhat aside from the chief respiratory passageway. They can be reached, of course, not only by particles of the air which we inspire, but also from the rear side from near the root of the tongue. If the professional tea taster wants to discriminate the various aromas he gargles the tea in order that the vapor may enter the nose cavity from behind.

Touch.—The impressions of the so-called fifth sense have long been divided by psychophysicologists into pure touch sensations, temperature sensations, and pain sensations. Compared with the richness of tactual impressions which the skin furnishes, it seems surprising that the analysis shows after all only one single quality of sensation

in various degrees of intensity. We know how in extreme cases of blind deaf mutes the tactual sensations may become the vehicle to bring the highest civilization to their minds; but we have only the one sensation, *pressure*, which begins with a slight feeling of contact and increases steadily. The manifoldness of apparently simple impressions results first from the spatial variations. The pressure upon a large area gives a different tactual feeling from pressure on a small spot without any conscious reference to the space. Moreover the contact at the forehead feels different from the contact at the finger; but the tactual quality may be the same, just as a color sensation is the same whether it comes from above or below. Secondly we receive many complex impressions as if they were tactual sensations of a specific kind. The smooth and the rough, the wet and the dry and the greasy give us significant touch sensations; and yet we can easily become aware that they are not new tactual elements, but combinations. The interrupting of the tactual sensations, the combining with the temperature sensations, the feeling of resistance, and so on are responsible for their mental structure. We have no independent touch sensations either when we discriminate light and heavy bodies; we perceive their differences not only by the intensity of the pressure on the skin, but by the pressure of the deeper inner organs and by the muscular effort of lifting.

A well-known phenomenon is the quick adaptation to tactual impressions. We are not aware of our clothes or of the chair on which we sit. The chief impression is always felt where two neighboring regions are under rather different pressures. The sense organs for touch are spread over the whole body, but they are distinct, isolated nerve apparatus. No touch sensation can be produced between these instruments in the skin, if the stimulus is sufficiently small and the pressure not so strong as to stimulate the neighboring regions. In those parts of the skin where hairs can be

found, and this refers by far to the greater part of the body's surface, an end apparatus for tactual impressions is near the root of every single hair. But also in those regions of the skin where there is no hair, the little end organs are distinctly isolated. On an average about two hundred may be found to the square inch, but they are unevenly distributed according to the biological needs of the different organs.

Temperature.—While the tactual sensations show greater simplicity than the popular view would acknowledge, the temperature sensations are of more kinds than is usually supposed. We speak of one temperature sense which, as the mercury of a thermometer goes up and down, reacts with different intensities of temperature sensation. The psychologist, on the other hand, must separate the cold sensation and the warm sensation as fundamentally different, and has good reason to consider the hot sensation also as an impression qualitatively different from the warm and the burning pain. The introspection corresponds here to the physiological discovery that cold and warm sensations result from the action of entirely separate sense organs. Just as the tactual end organs are small isolated instruments, the end organs for cold and the end organs for warmth are distributed over the whole skin, about seventy *cold spots* on the average to the inch, and irregularly between them a much smaller number of *warm spots*.

If we move a cold pointed pencil slowly over a sensitive region, we feel the cold sensations flashing up from time to time, and between these points no sensitiveness for cold at all. Yet the temperature limits below which the cold and above which the warm sensations arise are not constant; they are shifting with the temperature of the whole skin in that region. The most surprising fact, however, is that the cold spots, which do not respond to luke-warm temperature at all, awake a distinct cold sensation as soon as they are stimulated by a hot temperature. If a broad object

of about fifty degrees Celsius touches the skin, the effect, accordingly, must be that it reaches many cold and many warm spots. The warm spots react with intense warm sensations and the cold spots with cold sensations. This irritating mixture of warmth and cold gives an apparently unified impression of new character, that of heat.

The skin is finally the bearer of a fourth kind of end instruments, which are densely distributed over the whole body, the end organs for cutaneous *pain sensations*; they are more frequent than either touch or temperature organs. If a sharply localized stimulus like a needle point reaches such a spot, a thin little thrill can be felt distinctly different from a mere tactual sensation, and if the stimulus is more severe, a really piercing pain results. They easily fuse with pressure sensations and are characterized by a tendency not to fade and to produce long after-effects. We shall have to return to the discussion of pain when we speak of internal stimulations, but it ought to be emphasized from the start that the pain sensation in itself is independent of the unpleasant feeling which is constantly attached to it. In common language we are inclined to call a pain a feeling, as a pain which we get from being cut or burned is always strongly accentuated by this feeling reaction, while a color or a smell or a tone may be pleasant or unpleasant or indifferent. Yet the mere regularity of the connection does not change the character of the sensation. As we separate the tone sensations from their pleasantness or a foul smell sensation from its unpleasantness, we ought to consider the pain sensation, too, at first strictly as a sensation, and abstract from the subjective element of our disliking it.

d. INTERNAL STIMULATION

Movement Sensations.—The sensory functions of the organism appeared to us as the first part of the processes in the sense organ-brain-muscle arc; they start the com-

plex brain excitements which ultimately result in motor impulses to action. But these actions cannot really serve all biological needs of the individual, if the sensory impressions on which they are based are confined to that which goes on outside the body. The sensorial stimulations which come from within the body must influence the central and centrifugal processes as much as the messages from without. A fatigue sensation in our muscles, a hunger sensation in our stomach, a pain sensation in our head, may influence the central arc processes still more than colors or sounds. In principle there can be no difference between the excitements which are carried to the sensorial centers when the sense organ lies in the skin or when the sense organ lies in the joints or between the muscles or when the nerve itself becomes irritated. Those internal stimulations cannot show the abundant manifoldness of the world of sight and sound, nor do they offer an equal sharpness and distinctness of quality and of local difference. Moreover the difficulty which they present to a subtle study of the relations between the mental states and the physical stimuli is naturally much greater. Yet we must survey at least some specimens of these groups.

The psychologically most important stimulation from within is that which results from the movements of the body. Whenever we are acting, we receive impressions from our moving members. We may mostly ignore them, just as we usually disregard sensations of our skin. But as soon as we turn our attention to our walking or lifting or writing or speaking, we become well aware of the manifoldness of impressions which result from the activities. Even movements like those in respiration or convergence of the eyeballs may become noticeable. *The importance of these sensations for the structure of mental life is fundamental.* We shall find sensations of this group prominent when we come to the analysis of space and time perception, of attention and emotion and, above all, of the conscious-

ness of the self and the will. Yet these sensations themselves offer rather little to the observer.

We may discriminate two qualitatively different elements, the movement sensation and the tension sensation. The movement sensation, which is related to the real change of position, may result from passive as well as from active movements. Its intensity varies very slightly; it even seems doubtful whether we have a right to speak at all of different intensities of the movement sensation. The experience of weaker or stronger bodily movement is very complex: tension sensations and tactual impressions are combined there with the muscle sensations, and the muscle sensation itself usually becomes expanded over larger fields and lengthened in time when the movement grows. But a muscle sensation does not change its quality or intensity by being spread out in space and time, just as a color sensation is not changed by filling a greater area and a longer interval.

The sense organs which are stimulated by the movements are probably twofold. There are sensitive end organs in the joints. As every movement of our legs or arms or fingers involves rotations on the bones of the joints, these end organs must be affected by the muscle contractions. When we bend our limbs ourselves or when they are passively bent without our muscle contraction, the angle at which a change is just noticeable remains the same in both cases. This suggests indeed that the elbow or the knee or the wrist are the sources of the sensation. This is still more directly proved by the fact that the discrimination of active movements is greatly hindered when a galvanic current through the joint decreases the sensitiveness of these joint sense organs. Yet we are aware of our movements also in parts of the body where no joints exist. We notice the motions of our tongue and lips and cheeks and eyeballs. Moreover, even in passive joint movements pressure and tension on the muscles themselves are unavoidable. Probably not only the joints but the muscles too contain internal sense organs; they are stimulated

by the pressure which the contracting muscles exert on them. In any case the sensation is caused by the movement itself and not by the position of the muscles. It is certainly wrong to interpret the movement impression as a perception of successive positions. On the contrary we become aware of the position by the perception of movement. The mere position of the limbs in complete rest gives no characteristic sensation.

The *tension* sensation is very similar to the movement sensation, and yet can be distinguished. Here we may speak of different intensities, corresponding to the increasing physical tension. It is the tension sensation which informs us most directly whether the weights we lift are light or heavy, distinct from the movement sensation which tells us whether we lift the weights through a long or a short distance. If we try to move our limbs and are prevented, the pulling or pushing is again signaled to us by the tension sensation. The decrease of this tension is felt as a relaxation. The chief sense organs are here probably in the tendons by which the muscles are attached to the bones. Both the tension and the movement sensations resemble the contact sensations of the skin. Sensory nerves in the muscles are also the sources of the sensations of fatigue. It is an after-effect of long or strong muscle contraction. The lower degrees of this stimulation disappear if active movement sets in. Its higher degrees shade into muscular pain sensations. Both the movement and the tension sensations are covered by the much used term *kinesthetic sensations*.

As an appendix to the movement sensations that group of internal stimulations which secures the consciousness of head movements must be considered. If we turn our head upward, downward, right or left, or if our head moves with our whole body in walking or dancing or in moving by elevator or train, we notice every change of position and respond very correctly by eye movements and other reactions. The sense organ for this stimulation is a system of three *semicircular canals* connected with the inner ear. These canals are perpendicular to one another. As soon as the head changes from rest to movement or changes the rate of movement, the liquid in the canals produces changes of pressure on the walls and stimulates the nerve fibers. If the rate of the movement is constant, no stimulation

occurs. We do not feel the forward or backward movement on a smoothly running train. Only the change produces the excitement.

Feeling Sensations.—Another group of internally stimulated sensations, most important from a biological point of view, contains *pain* and *lust*. The one is constantly accompanied by an attitude of disliking, the other by an attitude of liking, but their qualitative contents can be considered independent of these subjective responses. We found cutaneous pain among the sensations which are excited from without and recognized that specific sense organs in the skin, distinct from the organs of touch and temperature, transmitted the excitement to the central nervous system. The unquestionable existence of special sense organs for pain in the skin suggests that the internal organs also are provided with special localized pain transmitters. Thus the pain of a muscular cramp may result from the excitement of specific nerves, and not simply from an abnormal overexcitement of those nerves which give us the movement sensation of the muscles.

It is well known, moreover, that pain irritations are not transmitted to the brain in the same paths of the spinal cord by which the tactual sensations are conducted. The pain may arrive in the brain considerably later than the touch, and may be eliminated while the touch remains. Many parts of the body are provided only with pain nerves. We do not become aware of these organs at all until an abnormal disturbance occurs. Not a few parts of the inner body are even without instruments for signaling disturbances. The intestines, for instance, can be cut or burned without pain; pain sets in only when the surrounding peritoneum becomes affected. Yet, while the body is provided with specific pain receivers, it is probably true that every severe injury to sensory nerves can lead to pain sensations, too. Finally the disturbance may occur quite

close to the sensory center of the brain region itself. An oversupply or undersupply of blood may cause headache. The typical sensation of lust starts from the sense organs of the sexual apparatus, when it enters into hyperemic conditions.

But pain and lust are not the only bodily sensations which on account of their intimate connection with liking and disliking are usually called feeling sensations. The conscious experience contains a variety of other qualities which must be classified in the same group. There are impressions of bodily comfort or discomfort, mostly spread over large regions, vaguely localized and fusing with many other sensations, especially kinesthetic and tactual sensations. Some, like hunger, stand on the border between discomfort and pain. We know to-day that the pang of hunger results from sharp contractions of the muscles of the empty stomach. Thirst, on the other hand, results from dryness of the mucous membrane and stands nearer to tactual and kinesthetic sensations. Other qualities are those of nausea or suffocation. In the group of the pleasant feeling sensations, tickling sensations and even the sensation of relief from itching, the sensation after satisfying the appetite, and of resting after fatigue, have a certain similarity to organic lust sensations.

CHAPTER VIII

ASSOCIATION

After-effects in the Nerve Centers.—We have surveyed so far the sensations which the surrounding world excites in the nervous system. In the lowest form of animal life, all the reactions are controlled by such sense impressions. The physical or chemical stimulus awakes a movement of approach or withdrawal, and the biological interests of the organism are sufficiently served by it. But we saw that the higher animals can survive only if the reactions are the results not only of present stimuli, but also of the earlier stimulations. If the past experiences of the individual can work together with the present ones in guiding the actions, the organism will become adjusted to a world of things far beyond the immediate reach of the senses. In man's life the present impressions are merely a small fraction of the contents of mind which control his actions. His whole past coöperates with the present surroundings. Hence our next problem must be: how can the sensorial excitements of the past be made active again? On the mental side, it is a question of the reawaking of earlier sensations.

We start again from the bodily apparatus, as we have agreed that we can find an explanation only on the physical side.

Recent experiments of the biologists have demonstrated that even the lowest animals show a certain modifiability of their behavior. If a sea anemone is stimulated, the reaction after the fiftieth stimulation will be different from that after the first; every impression left some traces. But with the lower animals this ability is very rudimentary; the older view was therefore that they cannot learn

at all. If we come to the higher animals this ability increases rapidly and is developed not only in the brain but also in the lower parts of the central nervous system.

If we take a frog, the head of which has just been cut, we can perform the following experiment. We dip one of its legs into a strong acid solution, and we see that it at once contracts as if to throw off the acid from the skin. The stimulus goes from the toes to the sensory center in the spinal cord, and the excitement there is strong enough to produce the useful motor reaction. But if we take instead a very weak acid solution and dip one leg of the dead frog into the liquid, the stimulus is too weak; no motor reaction follows. We try it again and again; everything remains undisturbed. But if we dip it perhaps the tenth time, we see the beginning of a little twitching in the leg, and when we come to the fourteenth or the fifteenth time, the leg may react with a complete contraction. The fifteenth dipping was not different from the first, but the sensorial impression in the center was this time strong enough to excite the response, because the fourteen preceding excitements had been summed up in the sensorial center of the spinal cord until the accumulated stimuli became effective. Thus *those nerve cells in the spinal cord of the dead frog have "memory."* This power to generate after-effects in the nerve centers is most fully developed in the higher brain centers.

The after-effect, however, is *not a mere continuation* of the sensory excitement. On the contrary, we know from the conscious experiences that the cerebral excitement ends, on the whole, with the stimulus. If the sensation did not stop when the sense organ process ends, our life interests would be badly served. How could we hear music or speech if one tone were to continue its excitement in the brain, while the second was coming in. If the snapping noises of electric sparks follow one another twenty times in a second, we can still discriminate them easily from a con-

tinuous noise. Each snap excites a sensation only for the short time of the impression itself. To be sure, stimulations which produce chemical action in the sense organ like light and taste and odor develop after-images, but these depend upon the prolonged process in the sense organ itself. The kinematographic pictures do not flicker if we get seven different views in a second, because each leaves an after-image which bridges over the interruption in which no picture reaches the eye. But this is an eye process, not a brain process. If we look at an incandescent lamp, then switch it off, we can see it still for a long while in the dark room, but it will follow every movement of our eyes. And after it has faded away, if we rub the eyeball, it will come again. In short, the direct after-image depends upon peripheral processes and not upon the lasting of the central excitement. The brain cell comes to rest and the sensation ends when the excitement in the sense organ stops.

To be sure, a certain *perseverance of a central excitement* is possible and is familiar to everyone. A melody may haunt us and may push itself again and again into consciousness without any apparent cause; a disagreeable scene which we witnessed may at any time break into our mind anew. It is as if the central excitement were continuing, and while it is suppressed by other impressions or activities, it makes itself noticeable whenever it has a chance. A feeling sensation, especially, may linger with us, and a mood may remain when its cause is no longer active. The persevering of processes may even develop into almost continuous mental images, fixed ideas may torture the individual and follow him through years. But it is evident that all such occurrences of central perseverance interfere with the normal life interests. They are disturbing by-products of the central apparatus. The perfectly efficient mind would not be troubled by fixed ideas and would shake off the moods when their cause had disappeared, and would not be molested by recurring

images and melodies, if no interest is attached to them. This form of mere continuation of the central excitement has abnormal character, or is at least a deficiency, however easily it may occur to a slight degree in the normal mind.

The after-effect of earlier stimulations, in order to serve the ends of the individual, must be very different from a mere persevering of the impression. If the past experiences of the organism are to be helpful in the guidance of action, they must make themselves effective not by a haphazard eruption but by *such a reappearance as may really enlarge the present impressions*. Nothing would be gained for the animal, if a pain or a pleasure of the past were accidentally to break into consciousness again, but everything is gained, if a consciousness of the earlier pain arises at the sight of the enemy which brought the pain once before, and the consciousness of pleasure at the sight of the place where food was found before. The one can now stir up the useful impulse to escape before new harm is done, and the other can reënforce the impulse to approach, for which the mere sight impression might be insufficient. If a hissing sound or a scent can bring back to the animal's mind the whole scene in which the same sound or the same smell once before played a rôle, the reaction is no longer confined to the present stimulus, but can now respond to the total setting, of which nothing but that one signal has actually reached the sensory centers. We call this *association*. The noise sensation is associated with the visual image of the scene in which it occurred before.

This principle of association controls the memory of man; it opens unlimited possibilities of supplementing the present experiences by reproductions. The sound of a horn on the street awakes in us the image of an automobile, and helps us to avoid, not the sound which we actually hear, but the visual object which we have not yet seen, but which we have often seen before, when we heard the warning sound. And step by step we might proceed from such

trivial connections of sound and thing to the most complex, where the sight of a printed name may awake in us the condensed experiences of years of traveling or of companionship or of reading. The actual impression may then be only an infinitesimal fraction of that whole excitement in the psychocerebral system which becomes the basis for our further action. Every reproduction, moreover, which is stirred up by this associative process then becomes itself an actual central excitement, and as such again the starting point for new associations. One impression may thus bring to life ever new groups of past excitations.

Association by Contiguity.—The biological interests of the individual thus demand that an earlier excitement be reproduced only together with some other excitement with which it was actually combined in a previous experience. This earlier combination may have been a simultaneous or a successive one. In any case the impressions must have been contiguous in consciousness. They may belong to the same group of sensations; the beginning of a melody may bring back the further tones. Or they may be of different groups in the same sense sphere; the melody may bring back the words with which it was sung. Or they may belong to two different senses; the melody may bring back the visual opera scene. The smell of iodoform may arouse hospital experience with its images, its conversations, its discomforts. Here we have the *fundamental law of association* before us. If two impressions have come to the psychocerebral apparatus together or in immediate succession, the later reappearance of the one brings with it a reproduction of the other.

How can we explain this process? We know that a real causal explanation has to link the physical parts of the psychophysical events. If we reduce the process to its simplest scheme, we should have, accordingly, on the physical side the central excitements in the two brain units, *A* and *B*. If later *A* is stimulated through the sense organs

again, some physiological process occurs by which *B* becomes excited, too, or vice versa. We are evidently obliged to suppose that by the first excitement the connecting path between *A* and *B* underwent some change, so that it became a *path of reduced resistance* between the two brain units. *A* and *B* may be the same as they were before the earlier experience, but the pathway from *A* to *B* has been altered. If *A* alone had been first excited, the process would not have irradiated beyond its cell substance, but if a path from *A* to *B* exists, which by previous psychophysical processes has become a path of least resistance, the nervous reverberation of *A* will extend to *B* and secure the reëxcitement in *B*. This is indeed all that is needed. We have a causal explanation of the elementary association process, if we can expect that the simultaneous excitement of *A* and *B* will change the constitution of the path which connects them, so that in future a stimulation of one of the two end stations of this path will be carried over to the other end station. The physical process in *A* is accompanied by sensation *a* and the physical excitement in *B* is accompanied by sensation *b*, and the result is that while directly the new excitement of *A* produces a reëxcitement of *B*, indirectly the sensation *a* causes the reproduction of the sensation *b*.

No doubt such a theory cannot be directly proven by anatomical or physiological demonstration. But it is so simple and explains such an abundance of phenomena that since the days of the eighteenth century it has offered itself as the most convincing principle of physiological psychology. It provides such a direct explanation that the effort to understand the causal actions of the mind was for a long while essentially a demand to reduce all mental activities to psychophysical associations. Moreover both the anatomical and the physiological facts seem to harmonize the better with this theory, the more we know their details. The theory involves the existence of nerve paths between

any two sensory centers, as associations can be formed between any two possible impressions. This was an almost fantastic hypothesis in earlier times. But modern anatomy has furnished a broad basis for this claim. The new methods of making the ramifications of the brain cells visible under the microscope have disclosed such endless complexity of interconnections that the mere numerical demands of the theory offer no difficulty. Besides this, the physiology of the brain leaves hardly any doubt that large clusters of brain cells exist which do not serve any sensory or any motor function, but are only connecting links between the sensory or motor cells. Through their intermediation any central unit may indeed be connected with any other unit, and the mediating path which was neutral before, may have become altered when its two end stations were simultaneously excited.

Finally, there is no lack of observable facts which indicate that the nervous paths do indeed become changed by functioning. Every act of training, every motor habit, shows that the nerve paths are no longer the same after performing a certain function. A disposition remains to perform it more easily. A physical-chemical alteration has occurred by which the resistance is altered, until the motor response becomes automatic. The forming of associations is in this respect similar to the forming of habits. We may suppose that if *A* and *B* are excited together, the shortest nerve path which connects them really carries a certain excitement to and fro, and that this prepares the nerve fibers for their later service of association.

Association by Similarity.—If the associative process is to serve the needs of life, its working must not be confined to some solitary *A* and *B* or even to some *A* to *Z*, but millionfold connections must be formed. Every complex image contains many thousand elements in itself. The discussion of the principle of association may refer to

single elements, but practical experience always shows whole groups bound to other groups. This must have important consequences. Not all elements will be contained in the new experience. Some more or less important parts may be lacking, and yet the remaining ones may start the associative process. If we have connected a name with the sight of a girl, we shall associate the name with her even if we meet her the next time in a blue dress instead of a green one. The material of the object may have been entirely replaced; yet the impressions which we received of its forms may still be sufficient to start the right associations. If we have connected a painter's name with a painting, his name will come to our mind also if we see a photograph of the painting. Not a single color impression is left there, but the form relations supply the essential experience for the association. The melody which we heard from a human voice will be associated with the words of the text, when we hear it whistled. Even the small drawing may bring to mind our previous experience in the midst of the landscape which it represents.

In the same way not only the associating but also the associated group may have lost a number of its elements or replaced them by others. A word may bring before our mind the landscape, but while we recognize that it is the seashore or the mountain which we saw before, it may lack every color element; and indeed not a few are unable to associate visual images otherwise than as gray. Many details may also have been forgotten; others which did not originally belong to the first impression may creep in. Moreover the object of association may have been frequently before our mind, every time somewhat changed. We may have seen a person in many costumes and in many positions, and if his name associates itself with his memory, we may think of him as he appeared at a certain moment, but we may just as well mix elements of different

times and combine them in a new picture which does not correspond exactly to any previously experienced one.

If two groups of impressions differ in some essential elements and yet are sufficiently alike to enter into the same associative connections, we call them similar. It is useful to us to have the associated ideas arise also if not the original impression but a similar one comes to our mind. It must therefore be a valuable auxiliary function, if any impression can awake in us first simply a similar combination of elements which we experienced before. If an animal which we have never seen stirs up in our mind the picture of a similar animal which we have seen before, we can later perform the right reaction, as the idea of the animal which we saw before will arouse all the associations which we previously gathered. The richest enlargement of our present sense sphere will thus be gained if our impressions awake not only the idea of those objects to which they were contiguous before, but if they also suggest similar objects of earlier experience. In other words, what the psychophysical individual needs to make the past coöperate with the present in the control of his actions is not only association by contiguity but also by similarity.

From all which we have discussed, it is easy to see that association by similarity does not really involve a new psychophysical principle. We recognized that similarity means a community of parts. There must be something in common between two similar faces or two similar landscapes or two similar novels. In the two similar faces the eyes may be quite different, but the mouth and the nose and the chin and the forehead may be the same. If there were no essential parts alike, there would be no similarity. But this means that the mouth and the nose which we see now contiguous to blue eyes were seen in an earlier experience contiguous to brown eyes. If the face with blue eyes awakes in us by similarity association the memory of a

face with brown eyes which we saw years ago, we have practically only the principle of contiguity applied once more. The present face was never together with the earlier face, but essential features of it were together with different elements in the past experience. They form the starting point for the associative process, and therefore the one complex object brings to our mind the other similar one. Only through this constant *intertwining of similarity association and contiguity association*, both ultimately based on the same elementary principle, the psychophysical mechanism reaches that marvelous power of adjustment which makes use of every earlier life event at every new step forward.

The Character of the Reproduction.—We have tried to understand the processes of association by recognizing their biological usefulness. But under this point of view one more demand is unavoidable. The associated reproduction must somewhat be different, after all, from the effect of actual sense stimulation. If this were not the case, there would be no chance to discriminate between the present impressions and the associated reappearance of the past, and if we could not distinguish between them, we should lose all consciousness of reality, we should confuse the present with that which has disappeared. Our actions would lack adjustment to the surroundings. To be sure, we know cases where all this does occur, where certain associations have the character of real perceptions, but they are the hallucinations and illusions, which must be treated as symptoms of a diseased brain. The individual who really hears voices or sees persons where no actual sense impression is given, must come into conflict with the demands of life and cannot be held responsible. He needs protection behind the walls of an asylum.

The normal man can experience associations with the immediacy of sense impressions without harm only if he is deprived of the chance to act. This is the case in sleep,

and it is therefore without danger that the associations which arise as dreams possess the life character of true outside impressions. And one other condition makes such sensorial freshness of the associations harmless or even useful, namely, when they fill out the blanks of perception. We gain through hearing and seeing and touching merely a part of the outer stimuli to which our actions respond. Our habitual associations fill out the gaps. It is difficult for us to discover the misprints in a proof sheet, because we do not see the actual letters; we replace them by the correct ones, which the other letters in the word demand and give to the associated impression the hallucinatory character of real perception. But if we abstract from these cases, we do discriminate between a real impression and an associative reproduction. We may remember the friend as he was sitting next to us, remember also his voice; and yet we do not believe that we actually see and hear him. Only through this psychological difference, which, of course, must be also a psychophysical one, can the play of association reach its practical usefulness.

It is impossible to characterize this difference between the sense impression and its imagined reproduction otherwise than by referring to the experience which is at everyone's disposal. We certainly have no right to call it a difference of intensity. The remembered white light does not become a dark gray, the remembered fortissimo does not become pianissimo, the remembered cold temperature does not become warm. On the contrary we are able to recognize in our associated image all the original differences of strength. We hear the symphony in our memory picture with all the shades of strength. Even impressions which in actual perception are just above the threshold of discrimination remain noticeable in our inner reproduction. It would be meaningless to say that the memory of a thunderstorm has less intensity of noise than the actual impression. If we remember it at all, we remember it with

all the strength of its noise. Yet it is incomparable with the actual hearing of the thunder. We should never in our most vivid reminiscence confuse it with the faintest sound which we really hear.

Nor have we a right to say that the associated image is less clear. Certainly many reproductions are vague, but many actual impressions are vague too; and above all we may remember an earlier scene with the subtlest details and sharpest outlines. Nor can we say that it is more changing, more labile, more fleeting. Many associated ideas resist every mental influence and last unchanged much longer than most of our sense impressions. Nor, finally, have we the right to say that the difference is one of vividness. The sense impressions to which our attention is turned are vivid in our mind, while many other perceptions may be at the lowest degree of vividness. On the other hand any of our associated ideas may reach the strongest degree of vividness, our whole attention may be focused on them, they may deeply impress us, and yet lack that character of the direct sense impression. The distinction between real seeing, hearing, touching and feeling and the associated reproduction of such contents is not a matter of the difference of vividness or intensity or clearness.

Yet we have no right, as has sometimes been proposed, to locate the immediate sensation and the reproduced one in different brain parts. We recognized that under certain conditions, as in dreams or in filling the blanks of our perceptions, the associated material can gain the full freshness of sense excitement. No less decisive is the fact that the reproduced contents enter into all the connections which the original impressions formed. The associated idea itself at once becomes the center for all the associations which had been formed with the original perception. It can also arouse exactly the same feelings, not only the higher affections, as joy or sadness, but even the immediate

bodily sensation feelings. The associated idea may easily stir up nausea or appetite or sexual lust. In short, the reproduced excitement can so completely take the place of sense experience that it would be an utterly uneconomic way of thinking, if we burdened the psychophysical theory with the hypothesis that sense excitement and reproduction go on in locally different regions of the brain. A most complicated duplication of nerve connections would be necessary.

Moreover, if we perceive an object for the second time and recognize it, it would mean, according to such an hypothesis, that the present impression associates itself with the reproduction of the earlier impression of the same thing, and we should have two distinct contents: the room as we see it now, and the room as we saw it last year. But nothing of that kind can be found in experience. If we see the room for the second time, a feeling of acquaintance arises and associations of people whom we met in the room may come to consciousness. But last year's impression of the room does not stand out from the new impression as a copy. The most natural theory is then that *impression and reproduction arise in the same brain cells*. Of course, inasmuch as the characteristic difference exists in consciousness, we must postulate some difference in the brain process, too. We are thus forced to suppose that the chemical process in the brain cell is not the same, when it results from associative processes as when it is stirred up from peripheral sense organs.

Conditions of Association.—Each element, and even each group of elements, stands in associative relations to many others. A name, a word, even a smell, may suggest numberless experiences of the past. If all were rushing to consciousness, chaos would result. Which associations actually are resounding depends upon many factors. Some of them are familiar to everyone. We all know that the connections which come most *frequently* into our life offer

themselves very readily for reproduction. But we know also that those which were most *recently* in the sphere of our experience have the most favorable chance. What we learned yesterday comes more easily to our mind than what we connected in our experience some months ago. Everybody is also aware that our memory connects very firmly those impressions which belong to an especially *impressive and emotionally important situation*.

We might reduce the facts to a simple laboratory experiment. We show to the subject a series of ten squares of differently colored paper. In presenting one after another, we recite with every one a two-digit figure, and afterward we show the whole set of colors side by side, and ask him to write the figures which were associated with them. But we may introduce the following variation. One of the color number pairs may be repeated, and one of them made impressive by using a three-digit figure. If we try this with a large number of persons, we find that the number which was last, the number which was repeated and the number which gave a surprise, are far more often remembered than any of the others. By careful experiments we can show the relative value of those three methods of association. The results also indicate that the pair which is given first in the series has a certain additional chance. This points to a fourth principle. Besides frequency and importance, the *newness* of a connection, which characterizes the beginning of a series, also offers strong chances for the reproduction. In every group of life experiences that which comes early influences our memory almost as much as that which comes last.

But we have not spoken of one condition, which may be practically the most important. The psychologists call it by the technical term *constellation*. As long as we consider an association as the result of one excitement only, we are dealing with abstractions. We never have only one starting point in our mind. Many impressions and ideas

are combined in us, and it is their constellation which determines the selection of the newcomer. Any word in a sentence might stir up scores of associations, if it were isolated. But as soon as it stands in the sentence, those possible companion words do not appear in consciousness at all. Out of the whole circle of possibilities every word pulls with it only those associations which harmonize with all the other words. The word may even have a double meaning; yet in the midst of the phrase only the one meaning which fits the whole situation comes to the mind.

But this evidently has also a negative side. If the various words in the sentence coöperate so that they demand only one of many associations, it means that they suppress the others, that they inhibit them, that they do not allow their appearance. This negative function of inhibition and suppression accompanies the positive factor of association at every step. And finally, can we really speak of our associations as if they were only reproductions of sense impressions and ignore the fact that they are also starting points of actions? If we look back over a journey, in the play of our associations we may traverse it backward as well as forward, beginning from the end and returning to the starting point. But if we remember a poem in which every word has been connected with the next by our learning process we cannot reverse those associations, we cannot begin with the last word and repeat the line toward the first. We can hardly say the alphabet backward. Evidently we cannot do so because every word involves the action of speaking. Thus the understanding of our associative mental action cannot be separated from the physical actions. As long as the bodily reactions and the processes of inhibition are disregarded, we cannot give a full account of the interplay of ideas. The discussion of associations singles out only one factor in the complex situation. We must now turn to the two others, the reaction process and the inhibition.

CHAPTER IX

REACTION

The Motor Process.—From our biological point of view we had to consider the nervous system as a complicated reflex arc which leads from the sense organs through the brain to the muscles. The present impressions work together with the reproductions of the past in stimulating the motor part of the arc. The whole process receives its significance from this final reaction. The organism which is stimulated and which reverberates from all the earlier stimuli, we saw, would be lost in the struggle for existence, if its movements did not secure the necessary adjustments. To run away from the danger, to approach the food is a typical achievement of the whole psychophysical apparatus. Yet it may seem as if such a movement were simply a bodily appendage, which may interest the physiologist but not the psychologist. The mental process consists in the impressions and associations. It appears as if the student of the mind should not ask what physical effects come after the conscious process.

But this would be misleading. Every step forward will show us more clearly that *the physical reaction which follows the central excitation is fundamental for the psychical experience, too.*

First, the physical reaction is itself a source of sensory stimulation. The impressions and associations cause muscle contractions. But these muscle contractions themselves are then causes of sense impressions. These sense effects of the actions are certainly mental states which con-

tribute much and perhaps an essential part to the conscious experience. Secondly, the actions have outer effects; they change the surroundings. These changes are perceived, and the ideas of these final effects become associated with the central states which led to the actions. And finally, the process in the brain cell itself must be influenced by the motor discharge in the center. The central process must be a different one, according to whether the path of motor response is wide open or is blocked. The centrifugal process must accordingly have a backward influence on the central process itself and may be responsible for the character of this central excitement. If this is so, the rôles seem changed. The centrifugal function appears to be almost more important than the centripetal one which brings the stimulus. It is the action of the organism which controls the mental life. We must now follow the reactions through these various stages.

Every human movement starts from the action of a special motor center. In the lowest animal forms the one cell which forms the body receives the impression and generates the reaction movement, but in every higher form of animal life the functions are separated. The sensory function ends in a center of its own, and the motor function begins in its own center, and between the two stands regularly a third element, an intercommunicating nerve apparatus which is influenced by the sensory cells and transmits the excitement to the motor cells.

Both the sensory centers and the motor centers can be found in every segment of the central nervous system. In the spinal cord the rear columns of gray matter contain the sensory centers, the front columns of gray matter the motor centers, the surrounding white substance contains connecting nerve fibers. In a corresponding way in the highest segment of the central organ, in the hemispheres, the gray surface layer, the cortex, consists of large sensory and motor regions. In the former the optical and acoustical and tactual nerve paths end. In the latter

the impulses for the movement of the face and the arms and the legs originate, and from these they are carried down to the lower motor centers. The inner, white parts of the hemispheres consist of fibers which lead the sensorial stimulus upward or which carry the motor impulse downward, or which interconnect various centers. Large areas of the cortex, however, themselves are interconnected. On every level each of these intermediating structures is linked with many sensory and with many motor cells. The result is that sensory excitements can be summed up, that motor impulses can be produced where one sensory stimulus would be insufficient, and that many motor centers can be brought into coöperation.

This distribution of the impulse in the intermediating apparatus does not involve a weakening, as the energy with which the motor centers work is not received from the sensory center. It is *stored up energy* which is simply released. The strength of the explosion may thus be quite disproportionate to the energy of the stimulus. The end instruments of the connecting cell may clasp those of the sensory and of the motor centers, but they do not grow into one another. A certain resistance remains which the excitement has to overcome when it passes from the centripetal to the central and from the central to the centrifugal apparatus. The complexity of this transition from the sense organ through the mediating neuron with its branches to the motor centers makes the act strikingly different from a mere conduction of an excitement in one given nerve path. The motor impulse may come much later than the sensory excitement; it may last longer; it may be in a different rhythm; it may be stronger or weaker; it may show effects of central fatigue or of changes in the blood circulation.

In its simplest as well as in its most complex form the reaction process of the nervous system serves the interests of the individual. We recognized in our general discussion that the usefulness of the functions offers no difficulty to the biological explanation; on the contrary just this serviceableness of the apparatus allows it to be explained by the same principles by which in the doctrine of evolution the development of all other useful organs is understood. The direct observation indicates too that the inborn anatomical apparatus is ready for useful

work before it can be controlled by any intelligent deliberation. The child begins life with the useful sucking movements and swallowing movements, reacting on the tactual sensations of the lips and tongue, and at every further step of the individual development he is dependent upon such preëstablished connections. He learns speaking because the motor apparatus which controls the vocal cords is interconnected with the sensory centers which receive the sound sensation. We can observe the same type of useful reaction where no mental accompaniment is in question. We have only to think once more of the decapitated frog. We saw that the spinal cord a few hours after death can still sum up successive stimuli. But we may now consider the exactitude with which the motor explosions of this lifeless spinal cord are adjusted to the outer conditions. If we apply some drops of acid to the left side of the dead frog's body, the left hind leg is immediately contracted and the toes rub off the injurious acid. If the left leg is held immovable and the irritation continues, slowly the right leg will be brought into action and by violent contractions it reaches the place on the other side.

The fundamental character of all these preëstablished reactions of the nerve arc is twofold. They either work toward a *continuation of a helpful influence* or toward the *protection from an injurious influence*. The source of the influence may be at a distance, like the objects which stimulate the eye, the ear or the nose, or it may be in direct contact with the skin or it may be inside the body. The reaction which makes the helpful stimulus continue and increase may be one of approach or of yielding; the opposite may be one of escape or of attack. This fundamental character of the reactions may take ever new forms, adapted to more complex needs of the organism, but even such a complex vehicle of progress as the process of imitation is a reaction by which the desirable impression is made to continue, and the same is true of the external actions which enter into the process of attention. The complication grows when an associative reproduction

takes the place of a direct sense excitement and the reactions respond to those memory products instead of to the perceptions. The stimulus becomes still more differentiated when the words as symbolic presentations of sense experiences replace the perceptions and memories.

But there is still much greater complication on the motor side. The simplest development is the mere expansion over larger and larger groups of coöperating motor systems. The irritation which the instrument of the dentist excites in the nerve of the hollow tooth may produce at first contractions of the muscles of the face, and then the nerve excitement may irradiate in the spinal cord to the motor centers which make the arms and fingers and finally the legs contract. More important, however, is the organization of the reactions in complex units. From grasping and walking to speaking and reading, writing and piano playing, there is a continuous growth in the organization of movements.

A fundamental condition for the perfection of life work is the *process of habit*. The more often a motor reaction has been performed, the more easily the sensory stimulus or its reproduction will lead to the appropriate response. *With every repetition the resistance is decreased.* The excitement for which many paths of discharge may exist flows most readily into the one which has been opened widely by such repeated performance. But this frequent reaction has still another effect which secures increasing efficiency of the central nervous system. The whole process forms short cuts. The way from the sense organ to the muscle becomes reduced by the linking of sensory and motor way stations. Through these the higher central organs are steadily disburdened and are able to perform new tasks. Reflexes in lower centers are steadily absorbed into highly organized reaction groups and the high reactions are through these short cuts steadily transformed into reflexes in lower centers. As soon as they have be-

come such mechanized reactions, going on without any accompaniment of consciousness, they may enter again into other complex actions; and this means an uninterrupted process of building up highly organized reaction systems. The writing movement is learned by developing slowly the ability to react on the models by the appropriate finger movements, but only when these have become automatized and have taken reflex form can they be made serviceable to the more highly organized reaction of writing a letter.

The centrifugal effect of the central excitement is, however, not confined to movements. The *activity of glands*, the dilation or contraction of blood-vessels and many other internal bodily functions are no less useful parts of the reactions. Again we must not think only of the strong effects which are readily noticeable, the shedding of tears or the blushing. Numberless such responses of the organism occur which only subtle instruments can bring to our notice at all. Electrodes in our hands may make it visible on the galvanometer whether the resistance in the palm of our hands changes through the activity of our sweat glands. The experiment demonstrates that these glands do indeed become active, when sounds reach our ear or pictures our eye. These organic activities may again, like the muscle reactions, result from the reproduced excitements as well as from the direct stimulations, and thus may be connected with any associations. It is possible to measure the amount of gastric juice which the glands produce, for instance in a dog, in response to the seeing or smelling of meat, evidently a reaction of highest value for the digestive process. If the dog often sees the meat together with a particular color, until an association is established between the meat and the color, the color stimulus alone, as the experiment shows, is finally sufficient to produce the gastric activity which prepares for the digestion of the meat.

The Sensory Effects of the Motor Processes.—The reactions in the muscles or in the other centrifugal organs have interested us so far only as effects of central ex-

citement. We reach their true significance for psychology as soon as we consider *these reactions themselves as sources of sensorial stimulation*. Our finger touches something painfully hot. The immediate useful reaction is that we withdraw our arm. This movement of withdrawing cannot remain unnoticed. It involves pressure in the joints, tension in the tendons, sensory excitement in the muscles; and this whole kinesthetic complex enters consciousness. The centrifugal process from the central organ to the muscles is thus followed by a centripetal response, and these kinesthetic impressions must combine with the pain which started the whole process. The conscious experience becomes enriched by this; the mind receives the pain sensation plus the muscle sensation, and they become intimately associated with one another, as the injurious stimulus produces regularly that movement of withdrawal. Mental experiences of this type are not exceptional and not dependent upon rare occurrences, but must arise in every instant of our life. Reactions go on in our body incessantly. Every eye movement with which we glance over the outlines of an object, every word which we speak, every finger movement and every step, is such a reaction, and everyone may be reflected by kinesthetic elements in consciousness.

When a new stimulus breaks into our psychophysical equilibrium, it forces on the organism first of all the kind of reaction by which the sense organs become adjusted and the whole body is set for the fullest possible perception of the intruder. This reaction is biologically most useful, as it must result in a more distinct perception, which alone can be the starting point for further action. But all these processes of response, these adjustments in the sense organ, these new settings in the body by which the head is fixed in the most favorable position for perception, and the muscles brought into tension, must bring to consciousness a rich complex of kinesthetic sensations by which the in-

dividual's own bodily personality is brought into the center of the mind. This is exactly what happens when a sound, a light, a touch, attracts our attention. Certainly the process of attention is far more than the mere awareness of these reactions of adjustment, but they are an essential feature.

The processes of space and time perception, too, cannot be understood, if the sensations which result from the motor reactions are disregarded. If a light point comes nearer to us, the two eyes which are directed toward it must converge in order that it continue to stimulate the two fixation points. This reaction proceeds automatically, but its sensorial effects pass into consciousness. We feel the increasing convergence of our eyes and this element enters into our perception of the spatial approach of the light. If our finger follows along the edges of a table, our tactual finger sensation may remain unchanged. But the movement of the arm is felt, and the kinesthetic sensation fuses with the touch impression and gives us a perception of the table's length. We move our head toward the source of sound in an immediate reaction on the different intensity in the two ears. Again it is the awareness of this reaction which gives to the sound its local shade. Of course, only the child has to go through the actual movements. In the developed mind the associated reproductions mostly replace the original sensations, and finally short cuts are formed by which even those reproduced sensations are skipped in consciousness. But our real space perception could never have gained its character without these impressions from real reaction movements.

In the time perception the tensions and relaxations in the muscle system are the chief sources of mental supply for immediate time measurement. In the case of emotions, this mental resounding of the actual centrifugal responses reaches its height. Those reactions which enter into the simple feelings, the movements of approach and escape

and of attacking occur here in all their shadings, but superadded to them are the sensorial effects of the dilation and contraction of blood-vessels, of the activities of glands, of contractions and relaxations in the face region, of changes in respirations and of heart activity. The awareness of these automatic reaction processes is not the whole of the emotion, but we do not know any emotion toward which this consciousness of the bodily changes does not contribute significant elements.

The mental effect of the reaction is, however, not confined to purely bodily sensations. Our muscles react in order to change the world. When our fingers move, they leave the written words on the paper, they produce the sounds on the piano. These changes in the outer world reach the senses of the actor. The original perception or idea which leads to the reaction is thus always followed not only by a perception of the actual movement, but also by the awareness of the outer effect, which too becomes associated with the starting point of the reaction. Our acting is the chief vehicle to carry material to our mind and to form there associative connections without end.

We may take one further step. The mental situation which leads automatically to an action becomes associated, we saw, with the sensory effect of the action. This simple associative process must then secure a further result: *the idea of the effect must itself start the movement*. Now a true circle is closed. The consciousness of the effect to be reached becomes the decisive forerunner of the motion, and through this new development the automatic action is raised to a will action. When we discuss the will, we shall indeed find that this anticipation of the idea of the end is the most significant feature of every will activity.

CHAPTER X

INHIBITION

The Suppression of Mental Contents.—We cannot understand the actual experiences of the mind, if we think only of its positive functions and forget the negative side. Stimulation, association and reaction are all on the credit side of the mind. We must look into the debit account too. A world of stimulation surrounds man and hammers on his senses. If all were admitted, a chaos of impressions would rush into our mind. But the mind would be still more overwhelmed by the tremendous onrush, if the associations had perfect freedom and were received in unlimited quantity. And finally if all the reactions could set in for which the mental starting points are given, the mind would be in a tumultuous activity. We know that our real life is quite different. The span of our consciousness is narrow. We take in only a few impressions at a time; we develop the associations only in some definite lines; and our reactions are orderly and well organized. Some selecting principle must be at work which denies entrance to the unfitting stimulations and which suppresses the undesirable associations and which cuts off large parts of the reactions. The usual technical term is inhibition.

How does it really stand with our impressions? Do we really hear and see and touch everything which comes into the sphere of our senses? We are reading an interesting story and are so absorbed that we do not hear the knocking at our door. Of course, the sound waves reach our ear, but the message which the acoustical nerve carries to the

center in the cortex evidently finds unfavorable conditions there. The sound is not really heard. Let the visitor at our door become more impatient and knock more sharply, suddenly the sound breaks into consciousness. But at the same time we lose hold of our visual impressions; we stop reading. When the prestidigitator on the stage is anxious to keep us from seeing what he is doing with his left hand, he simply performs some interesting trick with the right hand. The impressions from his right hand push themselves into the center of our consciousness, and although his left hand is in our visual field and actually stimulates our retina and through the optical nerve our visual centers in the brain, yet it is ineffective.

Under certain conditions this mental insensitiveness may be heightened. The extreme case may be found in certain states of hysteria, where the patient may be unable to perceive tactual impressions when pins are thrust into the skin, or in the artificial states of hypnotism, where in accordance with the suggestion which he receives the hypnotized subject may not see a person who stands near to him and may not hear what is said to him. In normal life, moreover, it is not necessarily one impression which crowds out another. It may be an inner excitement, an absorbing thought, an emotional irritation. We may go home from our work absorbed by an earnest thought and may reach our house without having really noticed anything on the street around us. The visual images of the passersby, the noises of the street, were in this case perhaps not completely inhibited, but they had lost their ordinary impressiveness, they had faded to a state of decreased vividness. We saw enough of the street to find our way, and yet not enough to remember any of the shop windows over which our eye glanced.

When I am hard at work at my desk, I do not hear the hurdy-gurdy on the street. Yet I can easily discover that it had reached my ear all the time, for I feel a relief the

moment the so-called music stops. The inhibition does not necessarily make the one impression victorious while the other is defeated. There may be a *mutual inhibition* by which the impressiveness of both is decreased. We can read a book and listen at the same time to a conversation, but neither comes to its full mental effectiveness. There will be either a certain fluctuation, by which sometimes the one, sometimes the other alone is vivid in our mind, or both will suffer and lose elements of their complex appearance.

A very interesting case of mutual inhibition is the phenomenon of *fusion*. We called it fusion whenever two impressions stimulating the mind at the same time melt into each other so that each loses somewhat its independent existence. Even in the elementary sensations we can find this in every field. The taste and smell sensations fuse with each other. Our muscle and joint and tendon and skin sensations, which we experience during the movement of a limb, may blend into a unity in which no one is completely that which it would be by itself alone. The color sensation and the gray sensation fuse. A touch, a temperature and a feeling sensation may blend into such a unit.

The classical case is that of the tone sensations. If two tones which stand in the relation of an octave are given together the unmusical person is hardly able to recognize the two sounds as two. They fuse so completely that each one is lost in the combined sound. This is true to a slightly smaller degree for the fifth or the third, and still less for the fourth. What happens in all these cases? Evidently the sensations which fuse are similar to one another. If they were not, they would simply interfere with one another, and one would inhibit its rival in consciousness. Just since they are similar, they can remain together. Yet they cannot remain in their original complete form. Each one loses certain parts. The one tone extinguishes something in the other and each is bound to the other by this

incompleteness. But this is then ultimately a partial inhibition.

The case is the more interesting, as it opens a vista of theoretical problems, which the psychologists have hardly approached yet. It suggests that the mental states which we call elements are after all complexes of simpler parts in consciousness. If the sensations of tone or color or taste or touch were truly the ultimate atoms of the mind, they could not lose any parts. But they could not show similarity either, as the similarity means a certain community of elements. Both the community of parts in similarity and the mutual inhibition of parts in fusion demand speculations about the ultimate structure of the sensations. For practical description in psychology we have good reasons to treat these sensations as elements, because they are the simplest parts which we can recognize in our experience, but, theoretically, we cannot deny that *these elements may consist of much simpler psychical atoms*. They cannot be found in our experience, because they are never isolated. We know them only in their complex aggregate.

The complete or partial inhibition of sense impressions finds its counterpart in the *suppression of associations*. A word like "house" may arouse numberless associations. We inquired into the principles which push some particular ones into the foreground. The image of the house which we saw last or which we have seen frequently or which impressed us by its beauty or by its affective home value, may be favored before all others. We attached special importance to the further principle of selection, the constellation of ideas. If we do not hear the word house only, but hear white house, and heard Washington in the sentence just before, the image of the one presidential residence is pushed into our mind by the constellation. Yet all these positive conditions which favor the associative selection could not secure the real effect, if they were not enhanced by the negative suppression of all the other pos-

able associations. The word "white" in "white house" may arouse in our mind the picture of snow or of lilies, and the word "house" may suggest the picture of our neighbor's cottage. But in the combination the "white" inhibited the picture of that brown house of our neighbor, and the "house" suppressed the memory of the lilies, and as "Washington" was still reverberating in our mind, no other white house came to consciousness, because every other specimen would have been inhibited by the idea of the capital. The negative influence is certainly not less important than the positive. The selection of the fitting offers no difficulty, if the mechanism wards off every unfitting association.

The Central Problem of Inhibition.—What is the formula which controls this suppression? We sometimes hear the superficial statement that there is room in our mind for one experience only. But what is one experience? We surely know that the mind has plenty of room for masses of impressions and they may be joined with an abundance of feelings and emotions, thoughts and memories. If we listen to an opera, we see the stage setting and the actors, we hear the words and associate them with the meaning, we hear the tones and the intervals in the singing, we have the memory of the first act, while we listen to the second, we anticipate the development of the coming scenes, and with this host of impressions we still combine the tones of the whole orchestra, discriminating the violins and the cellos, the flutes and the trumpets. No one of all these experiences hinders another; the orchestra does not suppress the stage setting, and the plot does not inhibit the orchestral music. On the contrary, they help one another; and if a new chorus comes to the stage, there is still ample room in our mind to see the costumes and to hear the song. But if some one near us begins to talk to his neighbor, we say that disturbs us. Their whispering is either suppressed in our mind, because we are absorbed by the music, or those

words beside us break into our mind and the whole performance, stage and music, are partially inhibited. Why are the orchestral music and the plot and even the thoughts of our internal criticism altogether only one experience, while the few words of our neighbors stand opposed to it as a second experience? Why are they inhibited by the music, while the words on the stage are reënforced by it?

The contents may be of most unlike character and yet remain peacefully together. At a gay dinner party we may enjoy the symphonies of taste and smell and touch and at the same time the witty remarks of our hostess. They all form the one experience, but if a tooth should begin to ache, or the thought of an engagement which we have forgotten should enter our mind, the new experience would stand out as independent and would subdue and try to inhibit the perception of the feast. A scholar in the midst of his research may embrace in one thought experience the memories of many a book and the consequences of complicated theories, but while all the thoughts are helping one another, there is not the least room left in his mind for the thought of his umbrella. It is not a question of the number of elements, nor is it a question of strength. In a hall full of noisy people a whispered word may find the way to our mind and may inhibit the much stronger sounds around us. A mother may sleep soundly through a thunderstorm, and yet the faintest sound from her child stirs up the psychophysical mechanism and awakes her.

A mere reference to the physiological conditions cannot help here either. It has sometimes been thought that one brain excitement inhibits another, because we may conceive the nerve processes as waves which may interfere with one another. But even if it were not so arbitrary to fancy the action in a nerve excitement as being wave movements, it would not lead us further, for our real interest is to understand why this particular excitement

suppresses one group of impressions and not another group. It is therefore no better if the psychical fact of the narrow span of consciousness is translated into the psychophysical theory that the brain has only a limited amount of energy. The same idea has also been expressed in the theory that there is a special inhibition center in the frontal regions of the brain hemispheres, which has the power to suppress sensorial excitements which conflict with the chief action at a given time. Why it conflicts is just what we want to know.

Physiological theories have supplied us also with detailed hypothetical schemes for the suppression of brain functions. It is said that brain cells are surrounded by capillary blood-vessels and that the cell function stops when those blood-vessels are contracted. The inhibition would be a kind of anemia of the cells. Or again it can be imagined that the fine branches in which the nerve fibers end are contracted. As soon as they withdraw the contact with the next neuron is interrupted. Inhibition of a cell function would mean then that its supply of nerve excitement is cut off because the bridges to other cells are broken. But, whatever the particular theory concerning the suppressed cell action may be, we still stand before the old problem why just this and not another cell, just this and not another center is cut off from blood supply or from nerve stimulation.

Moreover the real contrast does not consist in one group of impressions or ideas being inhibited, while the other simply goes on. The undisturbed group is at the same time somehow reënforced and emphasized. It becomes more impressive, more vivid, more distinct. While the inhibited content fades away, the remaining part gets a firmer hold of the mind, it forces itself on consciousness, it is the extreme contrast to the suppression of the inhibited material. We have recognized before that this greater impressiveness is in no way an increase of intensity. It can come to the slightest and weakest impression. The pianissimo of the violin may hold the audience spellbound and inhibit in everyone's mind all the routine thoughts of the day. If we are to characterize the changes by a single term, the best

is probably *vividness*. The mental content which inhibits everything around it becomes itself more vivid, while the other contents are shaded down through lower degrees of vividness until they completely disappear. To be inhibited means then to be at the zero point of vividness. The problem in its totality is then: *why do some mental states decrease in vividness, while others increase?* We saw that the mere reference to the narrow span of consciousness or to the number of ideas or to the relative strength of the ideas or to the interferences or limitations in the brain currents does not solve the problem.

The Inhibition of Actions.—We may perhaps come nearer to the solution, if we consider one other large group of inhibitory processes, of which we have not spoken so far. The world of action is controlled by inhibition, as well as the realm of consciousness. The physiologist knows many types of processes by which bodily movements are suppressed. He knows, for instance, that if an electric current stimulates the vague nerve which goes from the brain to the heart, the movement of the heart muscle is inhibited. But the psychologist is hardly interested in all the inhibitory mechanisms in the nervous system of the body. They probably belong to different groups, based on different principles. But there is one group which is of paramount interest for psychology, because it stands in very intimate relation to human will action. It is *the mutual inhibition of antagonistic muscles*, to which we referred before. It is not a theory but a fact that the muscle systems of our body are arranged as opposites. The simplest case is that of the flexor muscles and the extensor muscles by which we bend and stretch our limbs. We cannot do both at the same time, however quickly we may rhythmically alternate between the two opposite movements. We cannot both close and open our hand, inhale and exhale, turn to the right and to the left, look upward and downward, approach and withdraw.

But the interesting point is that this antagonism of opposite muscles is prepared in the central nervous system. The motor brain center from which the flexor muscles of the arm are excited has a kind of paralyzing influence on the nerve mechanism which produces the contraction of the extensor muscles, and vice versa. The physiologists have demonstrated this by their experiments on the highest apes. If the brain center for the stretching of the limb is electrically excited a relaxation of the opposite muscles sets in and prepares the way for the extension. Moreover if immediately afterward the center for the bending muscle is excited, it can be shown that its responsiveness is altered.

Many detailed theories explain this interaction between two such rival centers. A favorite idea is that the two antagonistic motor cell groups are connected by a *drainage apparatus* by which the stream of the nervous process is always drawn into the one of the two motor paths in which the stronger excitement is going on. If we bend our arm, because the motor impulse from the bending center is stronger than that from the stretching center, the drainage mechanism draws even the energy of the stretching center into the channel of the bending muscle. The stretching would thus be inhibited, not only because the activity in the bending mechanism is the stronger one, but because the activity in the whole stretching mechanism is eliminated. The stretching center is paralyzed by the power of its rival. But, however we may picture these subtle mechanisms, the decisive fact stands out clearly: the central apparatus for action is naturally organized in mutually opposing cell groups of which the activity of the one always suppresses the activity of the other.

The Action Theory.—This simple fundamental fact of the motor antagonism may throw light on all those apparently chaotic inhibitions in the sphere of sensations and ideas. We found there, too, that some groups of experiences became more vivid while others were suppressed,

but we could not discover any principle which controlled the selection. This difficulty disappears, if we consider the actions to which those impressions or ideas lead. Wherever one group of impressions increases in vividness and another decreases and fades away and is inhibited, there we find that the two would lead to interfering activities. This changes the situation entirely. In the world of ideas we could not understand why one idea excludes another, but in the world of actions we saw clearly that one action does and must exclude another, because their whole organization is antagonistic.

Yet this alone would not be an explanation. The one idea leads us to approach, the other to withdraw; the approach and the withdrawal interfere with each other. But the ideas evidently precede them. If the idea which demands the approach is the stronger one, we can easily understand that the approach will really result and that the opposite action of withdrawing will be suppressed. But we do not understand why the idea is inhibited which would demand the withdrawing. Yet we need only to connect the various elements of the situation and to presuppose that the activity in the centrifugal paths has backward influence on the sensory centers. The sensory excitement which finds its motor center ready for action is accompanied by a vivid sensation, and the sensory excitement which finds its motor center obstructed and indisposed to action is accompanied by a sensation of decreased vividness. An impression or an associated idea is inhibited when it would lead to an action for which the motor center is unresponsive. *The preparedness and unpreparedness for action in the motor centers thus becomes the regulating condition for the reënforcement and suppression in the whole world of sensations and ideas.* As long as we try to explain everything only by sense stimulation and association, there are no lights and shades in the picture. The most characteristic features of mental life, vividness and

... that they have
 ... to be known
 ... must be found
 ... mental life may
 ... to be sure, brought
 ... of some spiritual
 ... called apperception. It
 ... into the sphere of
 ... one and reject the other.
 ... process that. It was exempt
 ... connections; it broke into the
 ... like a miracle. Surely no one
 ... such a mind power which prefers
 ... has no reality, but its reality lies
 ... positive psychology. We shall find it
 ... energy, but in the sphere of causal psy-
 ... ingless. The reënforcement and inhibi-
 ... cted here as processes of the psycho-
 ... sm. The theory which we have traced
 ... is demand. It overcomes the narrow incom-
 ... the association theory and avoids the incon-
 ... the apperception theory. In contrast to both,
 ... is the *action theory*.

The theory does not give up anything which the
 association theory proposes. The whole interplay of re-
 sponses must indeed be explained by association. But
 in addition to the mere associative process, the motor proc-
 ess is of fundamental importance, too, for the
 psychological experience. Whether a color sensation is
 blue, and whether a noise is a roaring or a
 g. depends upon the sensory excitement only. But
 whether the color or the noise become vivid in the mind
 refused admittance, depends upon the conditions
 prevail in the motor centers into which their sensory
 excitement leads. If the channels of discharge are wide
 and the noise or color will be vivid; if the channels of

discharge are closed, they will be inhibited, like the noise on the street, which we do not hear when all our actions are directed toward the book which we are reading.

It is evident that this formulation of the action theory expresses the principle in its most abstract form. It becomes adjusted to the richness of life only when we consider how extremely complex the motor mechanism is, which, according to the theory, influences the reënforcement and inhibition of the sensory states. Every impulse to movement involves groups of other coördinated or subordinated motor impulses. In the same way the suppression of an antagonistic impulse must have its inhibitory influence on the coördinated and subordinated motor centers. But every one of these aroused motor cells has again its antagonist; every coöperating motor excitement therefore increases the vividness of certain sensory impressions or ideas, and every subdued motor cell group may cut off the chances of certain ideas and impressions.

Moreover our brain is never in a state of complete rest. The stimulus from without does not break into an inactive system. We need only to think of the thousandfold impulses which at every moment go to our muscles and to the walls of our blood-vessels. When these impulses fail, as in fainting, we fall down. When a new stimulus or a new association stirs up a new motor impulse, it does not enter an unexcited region, but it merely produces a change in the extremely complicated system of motor activities. The equilibrium of the parts of the brain is the equilibrium of a system of moving masses, and it is just this which explains its great plasticity. But we must further consider that the efficiency of those millions of motor centers, and accordingly their influence on the sensory sphere, must depend not only upon the actual nervous excitement but also upon a number of other conditions. Fatigue and exhaustion, the nutrition of the centers, the blood circulation, and above all the molecular changes resulting from previous training must contribute their part toward continuous changes in the motor system, on which the sensory centers play. Hence it is not surprising that exactly the same sensory stimulus may produce at different times entirely different motor reactions and may produce im-

pressions of entirely different degrees of vividness. The experiment of the physiologists proves too that the electric stimulation of a particular brain center can excite very different motor responses in the limbs of an animal according to the position of the limb at the time.

It is of course no argument against the action theory that numberless sensory states lead to action without becoming vivid at all. We have seen before that the reaction which originally passed through the highest sensory centers is slowly transferred to short cut paths which connect lower sensory with lower motor way stations. This abbreviation of the process secures the movement result as a mere reflex without participation by the higher centers. The sensory impression is in this case not noticeable, because the stimulus does not proceed to the higher sensory cells at all, but whenever these sensory end stations are reached, their strongest motor effectiveness coincides with their strongest vividness.

According to the popular view a world of impressions and ideas exists in us, entirely independent of our actions, and when they are complete and perfect, they send their message to some motor apparatus which carries out the order. Such a fancy must be entirely reversed. In every moment the motor situation decides the possibilities in the sensory sphere. Our ideas are the product of our readiness to act. The little lizard is not aware of thundering noises around him, but when the slightest rustling indicates danger, it perceives it at once and escapes. That slight noise met a disposition to reaction; the loud one is without significance for the system of the lizard's actions. We all perceive the world just as far as we are prepared to react to it. *Our ability to respond is the true vehicle of our power to know*, and all training and habit formation in the sphere of our actions shape and stamp the perceptions and memories and thoughts in our mind.

As soon as we have recognized the bearing of the centrifugal action on all the central processes, it seems only

natural to consider whether this same principle may not be expanded beyond the sphere of vividness and inhibition. We know that the experience of pleasure leads to one kind of movement, and that of pain to an opposite kind. We know that the stimulus coming from different points in space awakes different reaction movements, that a short or a long or a rhythmical impression awakes motor responses of very different type. May it not be that in all these cases, too, the character of the process in the motor centers has influence on the preceding sensorial excitement and gives a special shading to the mental impression which leads to those actions? The innervation of the approach movement and the innervation of the withdrawal movement may contribute to the feeling value of the impression, and the innervation of the right or left movement, of the quick or the continued movement, may reflect space value and time value on the sensation. The occurrences in a large railway station cannot be understood as long as only the incoming trains are studied and no attention is given to the outgoing trains which are dependent upon the clearing or blocking of the outward tracks and upon the direction in which they are to start. Whatever goes on in our mental life is dependent upon the clearing and blocking and switching of the tracks for reaction. The whole setting of our centrifugal system influences the flux of our thoughts and feelings, and furnishes all the means for really scientific explanation, while the popular theories refer to the mysteries of a subconscious mind. The influences which determine the progress of our mental life are not subconscious mental activities, but the settings of the centrifugal nervous mechanism. They decide what is to come to the foreground of consciousness. This answer to the central problem of mind, to be sure, is merely a psychophysical one, but we have recognized why we have no right to seek another answer in the realm of causal psychology.

CHAPTER XI

PERCEPTION

Unity of Perception.—If we turn from the elementary processes to the complex products in consciousness, our interest is not to search for new processes other than those which we have traced, but to examine the way in which the chief forms of our actual experience are to be understood as combinations of the elementary actions. The part which lies behind us is the fundamental study of the mind in terms of causal psychology. But the discussion of these elementary states dealt with abstractions; they exist only in the midst of the complex combinations. We do not experience isolated sensations or reactions, but ideas and emotions and volitions, and even these are bound together and are fused into a unified personality. We may single out one or another complex state as the object of our study, but we should falsify the situation if we were to deal with it as if it could really be cut off from the one interwoven tissue of inner life. We cannot possibly, therefore, proceed from one group to another without referring to the rest. The whole mental life is one dynamic system.

As our survey of the general processes began with the stimulation which excites the mind from without, our outlook over the special complex experiences may start with the perception in which the sense stimulations play the leading rôle. It makes no difference whether the peripheral senses or the internal sense organs are the sources

of the impressions. We can perceive with closed eyes our arms and legs through the joint and muscle and tendon sensations as well as we perceive the moon and the stars through our light sensations. But in every case we really perceive a physical object and not only the isolated stimulus to which the single sensation responded. Even the simplest perception involves many sensations, and its physical counterpart consists of many stimuli.

What binds a bundle of elementary experiences together and makes them one unified perception? The answer must refer to our own attitude, since it evidently depends upon us how a perception is limited in space, in time, in number, in manifoldness. I perceive at present the room in which I am writing, but in the room I perceive also the book shelves, and on the book shelves a single book, and on the book I may perceive the golden print on its back, and out of this a single letter may be my perception. We can only say that *any group of sense impressions is held together as a perception, if it is connected with one responsive attitude of ours*. I make use of the room as a whole, but also of the book, and in reading the title, the inscription on the back is the complete object toward which I take my attitude.

The same perceived object may speak through different senses. I may see and touch and smell one flower. The thing may also appeal to external and internal senses. I may see my hand and feel its muscular strain. But these sensations from external stimuli do not compose our total consciousness of the thing. Plenty of associative material may blend with that which reaches us at present through the sense organs. The man who sits at my side is perceived by me not only as that visual surface which he turns to me. I perceive him really as a substantial body. I do not see his back, and yet that back enters into the total perception upon which I react. If I by association add the legs of the man to my perception, in spite of the

fact that the table between us obscures them, I am still within the limits of the perception, since I cannot take any attitude toward his upper half without being controlled also by a vague reference to the existence of his complete body. But if the association brings to me an incident of the man's previous life, that story of his boyhood may associate itself with my perception, but it remains an independent experience. Even if my anatomic knowledge associates the idea of his heart and lungs, I should transcend the simple perception, since I can react toward the man without any reference to the contents of his chest. A true perception involves only as much associated material as is needed in order to make a unified reaction possible. This does not prevent me, if I am a doctor, from taking his eye or his nose as an independent object of perception, or if I am a barber from treating his beard as such.

The Elements of Space Perception.—If we turn to the study of perceptions, our problem is, of course, not to discuss once more the elements which enter into them, but the character of the processes which result from the combination as such. The psychologically most important one is the space relation. Yet at the very outset, we may meet an objection. Are we justified in considering the space character in our visual or tactual or acoustical perceptions as a complex experience? Ought we not to acknowledge that a certain *space value is inherent in the simplest element?* There must be something extensive in the elementary visual sensation, if we are to build up from visual sensations the expanded universe. Every touch sensation has its immediate space value, and even for the tones and the noises it has often been claimed that it is their original nature to be more or less voluminous. Then we should have to recognize spatial largeness and smallness, spread-outness and pointedness, as simple qualities, like sweet and sour or blue and red. In that case we ought to have dis-

cussed the space problem in connection with the other simple sensations.

Again others may say that the mere expansion may well be understood as the summation of elementary sensations, of which each one in itself is not expanded. Thus the consciousness of dimension, of largeness and smallness may indeed arise from the combination only and may be a super-added impression which is not contained in the contributing elements. But, they would say, each element has nevertheless a certain space value, namely that of location. The tactual surface may be a fusion of not expanded touch points, but each tactual point has a particular mental value which indicates where it belongs. Each light point which enters into the light area must be felt immediately as coming from a certain *direction*, and even every noise has this reference to right or left in its immediate content.

Such statements are certainly based on correct self-observation. Whether we can accept them as results of a final analysis cannot be decided, however, by such unaided introspection. We recognize the shortcoming of such simple self-observation in the field of space perception, as soon as we consider cases like the visual perception of depth. Nothing appears more certain to me in my immediate impression than the fact that here in my study the picture on the wall is further away from me than the chair at the side of my desk, and this still further than the book in my hand. The whole room appears to me with a characteristic depth value in which every single point has its distance from my head and nothing suggests that this might be resolved into simpler elements. But in such a case the experimental methods can help us to discover that this consciousness of depth is indeed the product of a very complicated coöperation of many factors.

It is influenced partly by knowledge. I know the size of the picture and the chair and the book. If I do not know the magnitude of my objects, I may, as Poe tells in

his story, take the little spider at my window for a gigantic monster in the far distance. The perspective and the distribution of lights and shadows help us, too, but the essential condition is a more complicated one. If I look into the room with my right eye, the furniture in the study must give me a different picture from that which I receive with the left eye. If I were to photograph the room from the position of my right eye and then from that of my left eye, all the details on the opposite wall would exactly coincide in the two pictures, but the nearer objects, the chair and the book, would be projected on different spots of the background. The angles would be different for the right and the left camera.

It is this *difference of the two retinal images* which produces the *effect of relative nearness* and remoteness. Wherever our two retinal pictures are identical, as in the case of seeing a painting, everything appears at the same distance. But if they are different, as in the case of seeing a statue, each light point which falls on two not exactly corresponding points of the retinae awakes the feeling of being nearer to us or farther away from us than the others. We can reconstruct that plastic effect most easily with a stereoscope. This instrument allows us to see through its two prismatic lenses two different photographs at the same time, the left eye seeing the left, the right eye the right picture. If the two photographs represent the same landscape from a left and from a right standpoint, the two flat pictures combine in our psychophysical system into one perfectly plastic model of the landscape. We see the tree in the foreground and the mountain in the distance with the same immediate perception of nearness and remoteness which we receive from the real plastic world.

The perception of the third dimension, which appears simple, can thus be demonstrated to be the product of a complex combination. Finally we may add one more

factor in the situation. Even if I close one eye, I can become aware of it when the edge of the book comes nearer to me or is moved away from me. The one eye can only receive one picture, but here, as the experiment shows, the changing accommodation of the lens becomes decisive. If the edge comes nearer, we can gain a sharp image only if the lens become more curved by the activity of the accommodation muscle. In really seeing the furniture of my room at different distances, I do not know anything of this change of accommodation or of the difference of the retinal images or of the influence of shadows. They all enter only as elements in the whole psychophysical effect. We may judge from such observations that the space impressions which appear elementary may yet be results of complex processes.

Space Perception and Muscle Action.—The case of the seeing of depth may, moreover, help us to recognize another feature of space perception which is extremely significant. We said that we are influenced by the changes in the accommodation of the lens. The curving of the lens itself, however, has no direct effect on the brain. If we become aware of the increased curvature of the lens for the near object, the functioning of the accommodation muscles in the eye must be responsible. But we saw that the chief condition for the feeling of distance is the difference of the retinal images. Yet they also become really effective by action. If I look at my room, my left eye sees the furniture differently from my right eye. If I fixate the distant picture, each line in the carving of the chair near by falls on the two retinæ at two places which do not correspond. If I really keep my eyes steadily fixed on one point of the wall, I can distinctly notice each line of the chair as a double line. But as I am anxious to see everything in the room as it really exists, I must instinctively avoid such double images, and therefore change my fixation point. I look at the chair; that now appears

single. But if I am careful in my selfobservation, the edge of the distant picture now appears double, since we get single images only from what falls on corresponding points.

Nevertheless I do not see these double images of chair or picture, if I simply look over the room in a natural way. I ignore them because they only work as starting points for a change in the fixation. Whatever awakes such a double image starts an immediate response by which we secure a new fixation, and our real attention always centers on those objects which we see single. This fixation, however, evidently means nothing but a position of the eyeballs by which the fixated point throws its picture on the center of the two retinae. If we fixate at first the distant wall and then the near chair, we must change the position of the eye by contracting certain eye muscles. Both the eyes must turn further inward for the nearer objects to fall on corresponding points in the retinae. In other words *the double image does not come to our conscious experience as such*, unless we especially try to observe it, but *it only serves as a stimulus for a change in the convergence of the eyeballs*. The seeing of depth through the coöperation of the two eyes is thus a function of the muscle activity too.

But we can go much further. There is *no perception of space in which muscle activity is not originally involved*. If we abstract from depth and think only of the visual surface, we know that the distance of two points from each other is measured by the movement with which the fixation point wanders to the left or to the right, upward or downward. If we fixate the one point, the other falls on the side part of the retina, and this stimulates the brain to respond by an eye movement through which the other point throws its picture into the retinal center of most distinct vision. Every single retinal area must be related to a definite muscular reaction in order to fulfill the chief pur-

pose, namely to bring each point into the region of distinct vision.

It is easy to demonstrate the influence of this muscular action on the space perception by the so-called *optical illusions*. The stronger the movement effort with which the eye passes from one end point to another, the greater the apparent distance. If we see two lines of equal length of which the one has at its end points angles which are turned outward and the other angles which are turned inward, the first appears much longer than the other. The accessory lines which are turned outward give an additional motor impulse, those turned inward inhibit the impulse of the movement toward the end point. A distance divided by five dots appears longer than an equally long undivided distance between two points. In the latter case the eye passes with one simple movement impulse from end to end; in the former it has to make new efforts at the way stations.

In a similar way we find an intimate correlation between tactual space perception and movement. We examine with our finger tip the form of a hole by moving the hand along its edges. Every detail of tactual outlines is represented in our exploring movements. Here, too, the space illusions of touch show a most intimate relation between increase of movement impulse and overestimation of distances. Even sounds and noises are no exception. The adult man is inclined to ignore the space relation of sounds, because spoken words and music are important for their quality and not for their locality. The child, and especially the animal, show much more the response to the space character of their impressions. We all turn our head to the source of a sudden noise.

Theory of Space Perception.—If every perceivable difference of local conditions in the outer world produces differences in the muscular response of the organism, it seems a natural idea to make this motor response contributory to

the explanation of space perception. A theory of this kind can take various forms. We have seen that the muscle contractions which we perform produce kinesthetic sensations which have their source partly in the joints, partly in the muscles and tendons. If we turn our head to the right, we are aware of the actual movement through our kinesthetic sensations. The automobile horn which sounds from the right makes us turn the head to that side; we feel the movement. May it not be that this movement sensation, which couples itself with the sound sensation, is just what gives to the sound its local character? Then the *movement sensation* is not felt as the indication of a movement, but as *the local value* of the sound sensation with which it is fusing.

That a sound is heard on the right side means that the sound sensation is blending with that particular movement sensation which results from the turning of the head. Of course, the adult person need not actually go through that movement. We hear the tone coming from the right, even if we keep the head still. But we have gone through a long life history. As children we did react on the sound regularly with such a movement, when the sound attracted our attention at all. The movement results from the difference of the intensity of sound in the two ears. The right ear gets a stronger sound than the left when the noise is on the right side of the body. We do not know anything about this difference; the sensations stimulated by the two ears are felt as one, and we cannot discriminate how much the one or the other ear contributes. But the inequality of the central excitement has an effect on the motor system. It breaks into the equilibrium of the motor impulses and pushes the head to the right, an important biological adjustment, as through this all our senses are directed toward the useful or dangerous source of the sound. As soon as this automatic reaction has resulted frequently, an association is established by which a memory picture of that movement sensation arises even when no actual movement is performed. The motor impulse itself becomes inhibited, because we do not care to turn our head for every chance noise which

we hear and we rely more and more on the associated reproduction.

We can readily understand how this same development took place in all the other senses. The distance of a visual point to the right or left, up or down, from the central point of the field of vision may also be felt by the movement sensation of the eye. The child is very slow in beginning to move the eyes toward the source of light and his spatial consciousness is at first probably very vague. But every visual experience is a new training in the performance of those eye movements which bring the side parts of the object into the fixation point. Here too the movement sensation is not felt as an action of the eye, but as the local value of the outlying light point. The motor impulses to the right and left normally balance each other, the eye does not need to go through the movements themselves, but the definite associations are again established. Every point of the retina excites psychophysical impressions which are associated with definite memory images of movement sensations, and these are experienced as the local values of the visual points. In the same way the feeling of tactual depth originates from the kinesthetic sensations of our moving limbs. Space perception, far from being an elementary process, appears, accordingly, as an act to which stimulation, reaction, association and inhibition contribute equally.

This intimate relation of impression and movement also throws light on the discrimination of neighboring stimuli. We can perceive two tactual points as different, if we touch them with the tip of the tongue or the tip of the finger, when they are one to two millimeters distant from each other. On the back of the hand the distances must be about thirty millimeters, on the forearm forty, on the upper arm or the thigh sixty. In short the ability to discriminate local distances corresponds to the mobility of the organ.

We must distinguish between fact and theory. The perfect correlation between psychical space value and motor response is a fact. The idea that the space value exists in the fusing of the lights, sounds and pressures with the kinesthetic sensations is a theory, and this theory may

be supplemented by other hypothetic views. In the light of all which we discussed, when we studied inhibition, it seems natural to suppose that the mere *reference to movement sensations is not sufficient*. We outlined there an action theory as against the mere association theory. The action theory claimed that the inner experience depended not only upon the incoming, but also upon the outgoing current; the central excitement is at every moment related not only to the sense impression but also to the openness or closedness of the paths of motor discharge. We insisted that the openness corresponded to the vividness of the sensation, the closedness to its inhibition. We added at once that other characteristics of the sensory state may also be dependent upon the conditions of the motor system. Not only the conditions of the channels of motor discharge, but the direction of the channels into which the sensory excitement flows, must contribute to the character of the process at the central station. The actual movement sensation which results would then be only a secondary help by which we develop our space perception, *the primary factor being the central process itself, with which the motor reaction starts*. Each light and sound and touch has its mental local value, because the central excitement from the eye and ear and skin involves the innervation of an impulse to a special movement. The opposing theories in the debate on space perception are usually called the *nativistic* and the *genetic*; the *nativists* claim that the space value is from birth an immediate trait of the impression, their opponents claim that space perception develops from the fusion of elements which themselves contain no reference to space. If we rely entirely on the movement sensations, we uphold the extreme genetic theory. If we consider the local value dependent upon the central connections of the motor impulse, we approach the standpoint of the *nativists*. We claim with them that every local impression has a certain local sign from the beginning. Yet we avoid

THE SENSITIVE PERIOD. The sensitive theory in the usual sense of the word is connected with the fundamental fact that every sense impression is bound together with a definite action. The sensitive hypothesis in the form of the motor theory acknowledges that the impression has some character from the start before actual movements have been started, but at the same time that every sense impression depends upon the relation to motor responses.

V. STANLEY says that the primary experience of the child is a spatial direction value in every sense impression. The heat, the sound, the touch and the pain appear to come from some direction and this results from the fact that every point by inborn disposition for qualitative reactions introduces a particular response. This direction value and not the simultaneousness is the true starting point of the child's experience. The space value in the perception world like that of depth and of special forms is in the development in the individual experience. But the development leads also to the fusion of the spatial, tactile and auditory space values with one another so that only one space, because we have only one system of actions.

Perception of Time.—The perception of time leads us to problems similar and sometimes similar to those of space. The problem is much simpler. We must be careful, however, to keep it free from the intrusion of neighboring problems. We are inquiring into the perception of time not into the time of the perceptions, that is, we want to analyze the mental states by which we become aware of the objective time relations. But we do not ask at present about the time relations of our mental states. An idea may flash through our consciousness or may be present in it for days, but that is independent of the time which is embodied in the idea. The event which lasted a fraction of a second may linger in our mind for hours, and we may

Think for a few seconds of happy years. The time duration of a mental state must be separated from the perception of time, just as sharply as the perception of space is always distinguished from the space in the brain in which the perceptions go on.

But furthermore the perception of time must be distinguished from the knowledge of that time which lies outside of our compass of immediate awareness. We remember our childhood, but we do not perceive it, and even yesterday's time durations are to-day no longer objects of perception. As soon as perception has furnished us a direct impression of present time, we can build up from that material the framework of the one idea of time with which we connect our memories, and finally the reports of history with their thousands of years or of astronomy with their billions of years. But the foundation remains the actual perception of the time distances which can be embraced by the span of our consciousness. The beginning of the time interval must still linger in our mind when it comes to an end, if the whole period is to be an object of perception.

As soon as the situation is reduced to this immediate awareness of time relations, the one-dimensional character of time offers indeed a much simpler problem than that of the three-dimensional space. The exactitude of our time perception can be measured by experiment. We may compare the interval between a first and a second click with that between the second and a third. No one has any difficulty in discriminating the two intervals if the first is ten seconds and the other seven or thirteen seconds. If it is nine or eleven seconds, mistakes will frequently arise. Such a simple experiment leads at once to the observation of the means by which we become aware of the time. Self-observation shows us that while the interval between the two clicks is apparently empty, inasmuch as there are no outer impressions, it is not at all empty in our conscious-

ness. A large variety of sensations arises, and their chief sources are our bodily reactions.

The first click produces a tension. As soon as the click has been heard, a relaxation follows, then we begin to wait expectantly for the second click. This expectation produces a new wave of tension. If the second sound does not break in before this new tension has reached its height, a new ebbing and swelling of our bodily tensions follows, and usually the act of breathing gives the cue to it. The inspiration becomes part of the tension; the expiration part of the relaxation. If finally after ten seconds, the second click is heard, this total image of the fading first sound with the afterimages of the tensions and relaxations and the final sound sensation blend into one complex perception of the time interval. We repeat this inner process in passing through the second interval. If the sound breaks in before the whole process has been passed through, we feel the interval as shorter; if an additional phase of the tension wave is needed, we feel it as longer.

This increase and decrease of tension plays a rôle in time perception similar to that of the movements in space perception. Which special organs are at work depends much upon individual habits. Not a few perform rhythmical movements to divide such an interval instead of relying upon the respiration. Ordinarily no one becomes conscious of these tensions as such, but they fuse with the impressions so fully that they become simply the indications of temporal values for the tactual or the acoustical or the optical stimulations. Anything which reduces these tensions must accordingly shorten the time interval. If we compare two time intervals of half a minute each, and the one of them is empty, while the other is filled with mental arithmetic or with the watching of an interesting scene, the latter appears much shorter. There was so much going on, and yet this manifold content did not make the time expand: on the contrary, it contracted it, because it

inhibited those tensions and relaxations which make us aware of the time. An afternoon full of errands and work passes quickly; the same hours spent in waiting for a friend who had promised to come appear extremely long, since we are constantly preparing ourselves for his entering by continued tension, which forces itself into the center of our consciousness. If the time interval is very short, the consciousness of reactions becomes less important; we rely more on the fading of the first impression. If the interval is long, the number of actual experiences play a rôle of increasing importance. But every bit of music reminds us of the independence of our time consciousness from the mere number of contents; two bars may appear to us of the same length, although the one is composed of two tones and the other of thirty-two.

Theoretically our chief point is that not the mere lasting of any sensation, but a special combination of sensations underlies the perception of time. The violin tone which fills one bar appears longer than another which fills a sixteenth of a bar, not because this tone sensation lasts longer, but because the two complex structures of tone and kinesthetic sensations which have been built up at the end of their sounding are different. If our content of consciousness which we have at the end of the tone of one bar's length by a magic spell were suddenly frozen in our mind and stayed on for a century, that violin tone would not appear to sound longer. If nothing changed in our consciousness, not even sensations of respiration or tension, and of course not visual or tactual sensations which would allow comparison, we should hear throughout the hundred years just a tone of one bar's length.

The action theory would add, however, that the innervation of these tension movements must influence the sensory process itself. The longer a noise or a light lasts, the longer the impulse for the tension is continued. This means a change in the central process, and we may assume

that this is accompanied by the feeling of time value. Hence we should acknowledge a primary time element given with the immediate experience, while the subtler development would come with the experience of actual tension and relaxation movements. But this primary time attribute would not simply depend upon the incoming current, but upon the discharge of the centrifugal system. The demands of the nativistic and of the genetic theory would then be harmonized in the field of time experience, too.

Perception of Meaning.—Opinions might differ whether the simplest experiences of space and time really depend upon combinations of elements or belong to the single sensations. Such diversity of views is impossible, when we turn to the experiences of difference, number, change, movement, melody, speech, harmony, meaning, recognition and so on. In all these cases the existence of several elements in the unity of the perception is the essential condition. But as the mere lasting of a sensation is not the same as a consciousness of its duration, the mere existence of different sensations is not in itself enough for the perception of difference. The hearing of different tones alone is not the consciousness of the interval; the experience of several sensations is not a consciousness of their number. In each of these cases the transition from one stimulus to the other is an independent act produced by the combination, and this act is felt again in consciousness.

We are at the borderland of mere perception, if we consider the consciousness of meaning. To be sure, nowhere is it more necessary to warn against the mixture of causal and purposive psychology. We are too easily inclined to interpret the meaning of a perception as if the mental state of perception pointed to other ideas. In the realm of purposive psychology, that is the true interpretation; in causal psychology it would contradict the presuppositions. The perception as a content of consciousness cannot point

anywhere and cannot do anything, but simply has its objective existence, and everything which we call its meaning must be contained in it. A word which we hear, a picture which we see, a tool which we grasp, has meaning for us when the sense impression fuses with associations which indicate its relations.

The word "hat" or "spoon" in our mother tongue has a meaning for us, but if we hear the words for the same things in Russian, they have no meaning. The sound sensations of the familiar words have been associated so frequently with various perceived hats or spoons that the reproduced image forms what many psychologists call an assimilation with the word. Our full perception of the words contains this added idea as a part. On the other hand, if we see the spoon or the hat itself, the perception has a meaning, because the hat associates itself with the idea of a head and the spoon with the idea of soup. Yet even the Russian word which we do not understand is not entirely devoid of meaning. Its meaning lies in the associated idea that this is meant as a communication and that this communication does not awake the desired associations in us; its meaning is that it is a foreign word. Thus the same group of sense impressions can awake perceptions with more or less developed meaning, according to the smaller or larger group of relations which are reflected in the associated elements.

We insisted that the real test of a perception lies in the reaction with which we respond. We acknowledged a true perception only when a unified reaction was involved. Every new shade of meaning from new associated elements must vary the impulse to reaction. The development in the individual, however, must lead to an abbreviation of the total process by which the proper reaction sets in even when the associations from which it gets its meaning do not actually rise to consciousness. The motor setting, the inner readjustment to the appropriate reaction, then be-

comes the meaning of the perception. The spoon and the hat may not arouse reproduced images, but a resetting of our whole central system. This makes it impossible to put the spoon on the head or the hat into the soup. *We know their meaning, because we are prepared for an adjusted line of action.*

If we hear a question, the whole group of words becomes the object of one complex perception. It may be that none of the words awakes real associations in consciousness; and yet we understand its meaning perfectly, because the words through their physiological connections have produced that central motor setting by which the appropriate answer is prepared. We understand the world because we act toward the world. But our real action is not the movements of our arms and fingers, of our lips and vocal cords, but the reorganization of our motor centers. In the view of the association theory the only conscious variations which can be recorded would be the assimilated associations of related objects, and the kinesthetic sensations resulting from the movements themselves or after-images of earlier movements. In the view of the action theory all this associative material would be acknowledged, but would be considered as secondary. The primary character of the meaning process would lie in this resetting of the motor system itself and its retroactive effect on the sensory processes. The sensory excitement itself would receive a new shading by the new setting in the reaction paths, and this would be accompanied on the psychological side by that new coloring of the impression which we call its meaning.

It is clear that the same object can have different meanings for different individuals, as the lines of action must vary in accordance with the habitual associations. The same stream which means to the boy a swimming place, to the sportsman a boating place, to the fisherman a fishing place, is to the manufacturer water power, to the chemist a combination of elements, to the landscape painter a silver

surface, to the engineer a place to be bridged over. The technical term for a *perception in which the relation to other objects predominates* is, by a tradition which has become slightly old-fashioned, *apperception*.

An especially important case of apperception is recognition. We perceive the object as identical with that of an earlier perception. At first this means that the impression awakes the association of the background in which we saw the object before. Not a copy of the earlier object enters consciousness, but a more or less vague idea of everything which was connected with the previous experience. This involves a motor setting by which the reaction is adjusted not only to the present stimulus, but to this stimulus plus all the other stimuli which were connected with it before. The appropriate reaction is therefore not a new one for the individual, but a familiar one. The setting for the motor response is easily established, because the previous experiences have prepared the way. The interference which may occur when new lines of action are opened is absent, and this smoothness of the process produces a reaction which is felt as familiarity. A short cut is easily formed: the familiar object does not really arouse the association of the earlier accompaniments, but awakens directly this feeling of acquaintance and leads immediately to the habitual reaction. In the language of the action theory we should say again that it is the ease of the opening of the motor channels which influences the central process.

The opposite process occurs when an object is expected and a different one appears, or if an entirely unfamiliar impression breaks in and demands reaction. Where the associations which give meaning to the perception are contrary to the objective situation, we speak of an *illusion*. We are under an illusion, if we mistake one person for another. The extreme cases are those which arise in the diseased mind, when the noises on the street are heard as the

calling of abusive words. But emotional excitement favors illusions in the normal individual. Fear makes the wanderer see the tree stump in the twilight as a highwayman. The emotion has opened those channels of discharge which lead the impression into wrong centrifugal directions and this reacts on the associations. The illusory elements may directly replace objective impressions. We replace the misprints by the correct letters, and hear in the spoken words that which we expect. It is the illusory attitude and the falsely adjusted setting which makes the perception itself illusory. While in the illusion essential parts of the perception correspond to the objective stimuli and only the associative elements are erroneous, the *hallucination* is without basis in the outer world. The patient who hears voices in complete stillness, sees snakes in darkness, experiences reproduced sensations with the vividness of actual sense stimulations. The dream consists partly of such hallucinations, partly of illusions, since many bodily sense excitements are interwoven with associative elements in the free play of the dream perceptions.

CHAPTER XII

IDEAS

Memory.—If the word ideas is used in its widest sense, the perceptions, too, are perceptive ideas, as against the memory ideas or the imaginative ideas or the abstract ideas and so on. In a narrower sense the term excludes the consciousness of the objects directly given to our senses and includes only those which are not immediately perceived, but are remembered, expected, fancied or conceived. A frequent usage in modern psychology is to substitute image for idea, and to call all ideational acts which are not based on sense perception acts of imagination. But we lose by that the term imagination for the important special function of which we think when we speak of the poet's imagination. Hence we shall retain the term ideation as the general function including memory, expectation, abstraction and imagination. The elementary process which plays the chief rôle in this whole group of ideational functions is that of association, which we have traced. Yet it would be very narrow to consider the actual occurrence of memories, conceptions, and imaginations, as the mere product of associational processes. When we discussed perception we saw that sense stimulation was the leading element, but we recognized that every perception demands, after all, processes of reaction, association, and inhibition. In the same way we must understand that in every ideational act all four groups of the elementary processes are contributory to the explanation. The associative process is based on that of stimulation, and involves reactions and inhibitions.

The memory idea renews previous perceptions. *The reproduction is never complete.* Strictly speaking, the present memory idea only has similarity to the previous perception. Moreover it lacks, like all reproduced sensations, that peculiar immediacy of the sense impressions. The remembered picture may conserve all the colors and differences of light intensities, but it has that faded character in which the freshness of the direct perception is lost. How far the qualities are kept depends upon individual tendencies. Many remember no colors at all, but think of the past in white, gray and black; others cannot reproduce tones well; again with others the kinesthetic elements of the perception are predominant in the memory picture, or the tactual sensations; many lack distinct memories of smells and tastes, of temperature, and of pain. Often elements are missing which were needed for the firm organization of the earlier picture; the memory idea becomes vague and shifting. But this is in itself not necessary; a memory image may be perfectly definite and constant.

It may also be easily aided by new sense impressions, inasmuch as the kinesthetic sensations can readily be produced anew through reaction movements. It is difficult to remember a name without an impulse to speak it, or to remember very marked forms without an impulse to follow their outlines by eye movements, or vivid actions without slight motor imitations. We sing internally the melody which we remember. Such movements may be carried out to a very slight degree only; and yet they may furnish fresh kinesthetic material to fill out some blanks in the memory reproduction. But the mere reproduction alone is not sufficient for a memory idea. It must contain a certain reference to the past. This may be vague and even illusory, but somehow the idea must be surrounded by elements which give to it its setting in the system of our past experience.

The readiness of the material to return to consciousness

must be dependent upon the frequency, the recency, the vividness, and the emotional impressiveness of the original experiences and upon the present constellation of perceptions and ideas in our mind. The individual differences in the ability to reproduce the connections of the world are not general but highly specialized. An excellent memory for figures may go together with a miserable one for melodies, or for jokes, and an unfailing memory for words in poems may be coupled with a torturing inability to connect names with faces of acquaintances. We must also discriminate the ability for immediate recall from that for lasting retention. On the whole, the power to retain what has once been learned is strongest in youth and decreases with maturity, while the ability for immediate recall is undeveloped at an early age and improves slowly.

The methods of acquiring the memory material with reference to correct reproduction has been one of the most fertile fields of modern experimental psychology. The importance of the problem for educational purposes has strengthened the interest in this theoretical question. In order to trace the laws of pure memory action it was often important to exclude the connections of meaning. The fundamental experiments have therefore been carried on chiefly with nonsense syllables. The influence of repetition or of the length of material or of the distribution of learning periods or of the accentuation of the material or of the interval between learning and reproduction or of the various senses could be determined by such method.

Six syllables need only one presentation to be repeated correctly, while for the same person twelve syllables may demand fifteen repetitions and sixteen syllables thirty. With increasing length of time interval the exactitude falls off, at first rapidly, then slowly. A number of repetitions at one sitting is never as effective as the same number divided into several groups of repetitions. Rhythmical learning is a very effective help. Learning in large parts

is much more economical than learning in little bits, however much superficial impressions may seem to contradict this statement. The experiment can also neatly show how secondary connections are formed. The first syllable connects itself not only with the second, but to a certain degree with the third and fourth. Yet there is small tendency toward a backward connection. The ability to learn increases with training. The prejudice that a memory is good or bad by nature and that nothing can be acquired but external tricks of memorizing is untenable.

One important factor is still little understood. Memory material sticks best to the mind when no new mental engagements follow the period of acquisition. If we hear a series of words, the learning is not completed when the last word enters our consciousness. If a class hears a series of twenty words, the average pupil may be able to repeat twelve of them after a pause of three minutes, if the class did nothing during the interval. But if during those three minutes every one had to multiply some figures, the average pupil may not be able to remember more than three or four words. It seems that the psychophysical process needs a certain *physiological organization*. The new memory material must settle down, and is lost if it is stirred up by other mental engagements. This process of settling can be observed also in cases of accidents, where a fall or a blow on the head destroys the memory for recent events. The last few hours before the blow are lost to memory. This shows that the recent impressions must be retained in a different form from the older ones. They are not sufficiently organized to be kept in the brain through such a crisis.

The failing of memory is biologically no less important than its success. Where memory succeeds it brings us back part of our past in order to regulate our present reactions with the help of previous experience. It renews the objective situations which were similar to the present ones

and allows us to adjust our actions to a much larger part of the world than that which reaches our senses at present. Yet this most useful function of memory would become a hindrance to unified action, if every signal renewed all the experiences which ever have been connected with it. A tumultuous overflowing of our mind would destroy the preparations for definite reaction. It is necessary that this mechanical power of reproduction be held in check in order to exclude everything which is not significant for the present situation. The mere chance impressions which awake no important reaction therefore leave practically no traces in our memory. We do not remember all the advertisements over which our eye had to glance in reading the newspaper, nor are we able to renew every street scene which we witnessed without interest. It is equally important that the material which at first was held in memory fade away as its practical significance for new situations decreases. Finally the limitation of memory results from actual inhibition. The presence of certain ideas prevents the reappearance of others which are antagonistic.

The extreme development of the positive memory function may be found in the exceptional cases of mathematical or musical prodigies or of famous polyglots; the extremes of the negative functions show themselves in the pathological loss of memory. With the approach of old age a disintegration of memory sets in by which with surprising regularity first the remembrance of proper names fails, then the words for concrete objects, then the words for abstract ideas. In disease, however, the more characteristic feature may be a general loss of memory for all the recent events, or a partial loss covering specific groups of sensory material. A widespread symptom of fatigue, especially among women, is the memory illusion by which a present experience is accompanied with the feeling that exactly this scene was lived through once before.

The opposite of our memories are our expectations. Our

expectation links the ideas with the future as memory does with the past. Yet the material is the same. No expectation can introduce elementary content which is not gathered from the past, and only its order is adjusted to the expected future conditions. The walk which we took yesterday and the walk which we expect to take to-morrow over the same road are before our mind in the same ideational state except that we are less bound in the combination of elements in the idea of that which is still to come. But where this expectation is based on exact foresight or calculation, the idea projected into the future may have exactly the same definiteness as that referring to the past.

This does not exhaust the time shades of our ideas. We may have ideas of present objects without perceptive character. If we close our eyes we can imagine the room around us. Yet probably most of our ideas lack this time signal altogether. If the word apple links itself in our mind with the picture of the fruit or of an orchard, it is not an apple of the past or of the future or of the present; it is temporally neutral, a mere reproduction of the qualitative elements. From the viewpoint of the action theory we can hardly overlook that these four time signals of our ideas are forms of psychophysical reaction. The future is that for which we are still preparing our act, the present that toward which we are acting, the past that with regard to which we can no longer act, so that our response cannot change it, and the temporally neutral is that which does not cause independent reactions, but enters into a larger complex which controls the response.

Imagination.—The ideas which we have considered are reality ideas. They bring into consciousness the real objects of past, present, and future. The ideas which the imagination produces share with them the character of the material, as even the wildest imagination cannot develop elementary contents which have not their origin in earlier perceptions. They also share with them the different tem-

poral relations. It is true that our imagination has its most natural hunting ground in the future, just as our reality consciousness most easily refers to the past in the form of memory ideas. But, as we saw that our memory finds its counterpart in our expectation, so our imaginative picturing of the future is balanced by the imaginative play on the past. Our fancy may adorn our personal memories and turn them into imaginative ideas or may enliven the reports of history. The child who treats a piece of wood as a doll or as a horse has his imagination playing on the present object. Finally a thing of beauty in the artist's mind is neither past nor present nor future.

What then characterizes the ideas of imagination? We said that memory and expectation were controlled by objective reality. The functions of the imagination are *controlled by subjective demands*, by feelings, emotions, interests, and wishes. Certainly it is the same material as that which fills our memories, but it is brought into new combinations which are freed from the control of reality in order to serve the personal desires. The creative poet builds up a world of events with the consciousness of their unreality, held together by the artistic emotion in his mind. With perfect freedom he can repeatedly change them until the imaginative picture satisfies completely the feeling which inspired him. But without any genius any one can build his imaginative castles in the air which are to fulfill his hopes. Yet it is imagination, too, if gruesome pictures of dangers take hold of our mind under the pressure of our subjective fears and anxieties.

Modern theories claim that even all our dreams are only the imaginative fulfillment of wishes which are suppressed in our conscious life. The scholar, too, works with imagination, however concrete and real his material may be. He does not allow his imagination to decide the objective facts which he studies, but he needs imagination to construct hypothetical possibilities, and in doing so his ideas do

inspired mind to the subjective interest. As soon as his imagination has formed such inspired ideas, his sober reason has to test them and to compare their consequences with the actual facts. The freedom of the imagination, of course, must not be misinterpreted as if it meant that the imagination in consciousness is less determined by the laws of psychological behavior than memory or expectation. The difference is only that the combination of elements is controlled by the emotional setting. Just those associations which are most frequent or most recent may be inhibited by the actual feeling and rare unusual associations may be reinforced by it.

Where the imagination overpowers the world of perception and memory so that the individual can no longer adjust himself to the concrete surrounding life, we have a pathological syndrome which may develop just as well under the pressure of depressing as of exciting emotions. Within the limits of normal life the richest play of the imagination need not interfere with the demands of reality. It may relieve the pressure of reality without obscuring its demands. The distortions are extreme. No one can exist without memory, but a matter-of-fact life can be well carried on without a spark of imagination. Yet the will to serve reality is certainly not in itself an inhibition to the imaginative impulse: on the contrary, just as the true scholar needs the stimulus of imagination, so no one can attain high goals in any sphere of life who is not lifted by a constructive imagination.

General Ideas.—We emphasized that not only the imaginative ideas but even the most faithful memory ideas lack elements of the original impression and add foreign elements suggested by the constellation of consciousness. We may remember the big tree before our house, but it is impossible that every little branch and every leaf should be in the memory picture as it was in the original. The reproduction must necessarily be still further removed from

the earlier impressions which contribute to it, when the situation points equally to a large number of previous perceptions. If I hear the botanist speaking of an elm tree, the picture of the elm tree before my house has no more right to illustrate that tree idea than a thousand other elm trees which I have seen. If all were rushing to my consciousness they would inhibit one another. I should not get any details, and at the best certain chief features which recur in all those similar pictures would arise in vague outlines. Sometimes a process of this type occurs, a composite memory picture into which many single experiences have entered with equally strong influence.

Yet this is certainly not the typical form of a general idea. Usually it would even be impossible to form such compressed pseudo-memories. What a monster that conception of animal would be which is amoeba, spider, snake, and elephant at the same time! In most cases we find by our selfobservation a very different content of consciousness. In a botanical discussion I may think of tree in general, and refer to all possible trees in the world; and yet I may find in my consciousness only the picture of that one tree which stands before my window. It performs its task in the mechanism of my mental operations just as well as if I had pictures of all imaginable trees. Why? Because now this one tree picture does not enter into the same mental relation as it would if it were meant as a memory picture of the one tree. What changes the total situation is *the different attitude, the motor setting of preparation for further developments* in my psychophysical system. I treat this one tree as standing for all the trees in the universe. It is only a cue for the opening of all the channels of discharge which are needed for reaction toward trees in general. This response in the system allows us to feel that any other tree would perform the function just as well. The image of one or another is then only a kind of mental appendix. The attitude is the really essential condition by

which the word with the representative image, or even without it, gains the value of a general idea. Again we have here a case where the attitude itself shades the central process.

This attitude character of the general idea presents itself still more clearly in a second type. We may form a concept not only by putting together a large number of similar experiences and abstracting from that which is different in them, but by building it up from the elements which its definition suggests. The word which designates the concept then comes to us as a demand. It does not awake a composite memory or any particular substitute for it, but it stirs up the demand to admit only such ideas as suit the definition. The conceptions with which the lawyer or the mathematician or the philosopher works are words which demand a particular attitude through which the further mental response is controlled. The pictures which the memory or the imagination contributes as fringes of the conception are merely secondary means to vivify it, to hold it actively in consciousness and to insure the openness of the channels of attitude. The difference between theft and burglary in the lawyer's discussion is entirely independent of the question whether some specimens from the rogues' gallery are lingering in the mind, when the conceptions are thought in the meaning of their definitions. The younger the mind, the more we find tendencies to connect concrete pictures with a conceptional word. If association experiments are carried on with children, the words usually awake individual memories. The habit of connecting the word with a generalized attitude develops slowly, and also in adult individuals remains very unequal. A too early habit of thinking in words only is found more in nervous than in normal, healthy children.

The closing word in the study of ideas must be the warning against a purposive interpretation in the midst of causal psychology. This danger of confusing the aspects

is nowhere nearer than in the discussion of the thought processes of which the general ideas are the vehicles. It is as true of the conception as of the perception that it does not point to anything beyond itself. It is simply a given process in consciousness. It has no internal relation, but only certain effects in our psychophysical system. Its meaning consists of certain elements in it and of certain influences on the succeeding processes. Its meaning is not an inner reference to something which lies outside of it. *Neither the perceptive idea nor the memory idea nor the imaginative idea nor the abstract idea can mean anything outside of itself, as long as we remain in the world of causal psychology.*

CHAPTER XIII

ACTIVITY

The Impulse Feeling.—If we had to divide all the mental processes in the individual into two large groups we might consider the perceptions, the memories, the fancies, the conceptions with which we have dealt so far as one class, and the inner activities and emotions which we are now to discuss as the other. The former reflects the world in our mind; the latter reflects our own personal response to the world. Yet such a division is after all for the purposes of causal psychology a superficial one. It is still influenced too much by the reminiscence of purposive psychology. If we ask for the meaning of those mental experiences, there cannot be any more fundamental contrast than that between the world and our self. But if we study the structure of the experiences as mental processes in consciousness, the perception of the changing things and the consciousness of our acting self are similar in their organization and constitution. Both are the products of the same elementary processes of stimulation, association, reaction, and inhibition.

We turn to the activities. They are not dependent upon external movement effects. To seek a name which we have forgotten, to solve a problem, to turn our attention to an idea, to reason out a conclusion, or to make a decision is just as much an inner activity as the instinctive impulse to run or to fight or the deliberate reply to a question. The word "will" has become rather colorless in causal psychology, but after all it serves best to suggest

the common factor in all the inner activities. There is a will factor in attention and thought and constructive imagination as well as in desire and impulse, decision and choice.

What is this common trait? It certainly cannot be found in a particular element. Wherever the selfobserver stops his introspective analysis with the belief that he can discover a special will element in all or some of these processes, he is misled by an illusion which can easily be understood. He has not freed himself from the first demand of purposive psychology. The unity of the meaning of will and the incomparable character of the will act in real life exert a spell on his power of introspection. He does not analyze the will, because he does not take it as an object in consciousness; but he experiences the will by feeling it instead of by observing it. *As soon as the will is looked on as an objective process it can and must be resolved into elements each of which in itself is without will character.* It is the form of their combination which constitutes the process of inner activity. The will is then complex as much as an idea is complex.

The process of inner activity demands at least two conscious factors. A change must go on, and *an idea of the result of this change must precede the process.* Everything else is secondary. If we do not anticipate the end, we do not experience a will process. Wherever an end which can be reached by our own deed is held in mind before the action itself sets in, we feel that we are acting by our own volition. It makes no difference whether the end is a performance of our muscles or a shifting of our thoughts, whether we move things or select words. If I try to remember a telephone number, and it finally comes to my mind, I feel its appearance as the result of my will effort. I was seeking the number and secured it by my volition. Of course the digits themselves were not anticipated in consciousness; I did not really have the number

in my mind; otherwise I should not have sought it. But what I was seeking was, after all, something which was fully determined beforehand in my mind. I knew that it was a number which I had heard and which I had used before, and therefore that unknown thing in my mind was really identical with what I finally found, when the right figures slipped in.

If we have to do with an external action, if I rise to take down a book in my library, it seems as if a new element had come in. Here, too, the end is in my mind beforehand. I think of the taking of the book before I move my arm to it. And again it is fundamental that the foregoing idea of the end correspond to the final effect. Yet it seems as if the most essential part were left out after all. Is there not a mental process, a feeling of impulse, an act of decision, between my thinking of the book and my getting up and grasping it? Is not the whole mystery of the will inclosed and hidden in this feeling of impulse? But a careful analysis can disentangle this last impulse experience, too. If I think of taking down the book, the whole action depends upon the first step, the getting up from my chair. While I have the book in mind, I am conscious that I need a series of movements before I can reach it. The entering upon the first movement decides whether the total action unified by its final end is to be carried out. Accordingly I must have in consciousness the idea of the first motion as the real cue for the entire process.

This kinesthetic idea of the first movement preceding the action itself is the only content which we call the feeling of impulse. It is indeed of decisive character, inasmuch as this idea of the first movement leads to the movement itself. But if this is the situation, the impulse feeling is again only a special case of the general rule which we stated, that the change must be preceded by the idea of the effect. The kinesthetic sensation, which is the result of the first movement, is anticipated and precedes the move-

ment itself. Hence we have the feeling that it is a volitional procedure, and feel the forerunner as the impulse for the whole act. We have, accordingly, no impulse feeling for a movement which we have never performed; we must first have acquired the impressions from actually carrying it out in order to gain the arising sensations as associative material which we can awake before the movement is carried out again.

But while the consciousness of movement which is preceded by the kinesthetic sensation is a typical case of will activity and the one case which is most easily misinterpreted as the intrusion of a special will power, it is surely not the most frequent experience nor the original one. The end before our mind is generally not the movement itself, but an indirect result of the movement, a change in the outer world, and the first motion is not felt as an independent goal, but is entirely subordinated to the complex activity. My idea of the book which I am to take from the shelf may be the only pacemaker for the action, and that first auxiliary movement of rising from the chair may be so subservient to the whole process that a special anticipation of this first kinesthetic idea as a cue for the whole is left out. The idea of taking the book sets the complete chain of muscle processes in motion. A special impulse feeling is then lacking, and yet I feel the getting of the book as the result of my inner activity, because the idea preceded. If I had gone to the shelf, while the anticipated idea was to open the window, the outer process would have been the same, but it would have appeared involuntary.

The Rivalry of Motives.—The consciousness of self-participation which characterizes every will act is reënforced, when several ideas of possible ends are anticipated. I think of taking the book from the shelf, but I also think of glancing over the newspaper on my desk. Whichever of the two actions I perform the end was in consciousness beforehand. I finally decide to let the paper alone and to

rise for the book. What was added to the process? Possibly nothing at all in my consciousness. Everything which happened may have happened outside of it. And yet it is clear that somewhere a complex rivalry must have gone on. We must take it that each of the two anticipated ideas was influencing the channels of discharge. The idea of the book excited those motor centers which would make me leave my place to get the book, and the idea of the paper hammered on other centers which would hold me back at my desk. One group offered less resistance than the other, or the stimulus was strengthened by accessory physiological excitements, and when the one started the movement process, the other became inhibited. The message which came to consciousness was only the perception of the actual rising and getting the book. But while this may be the only experience in consciousness, it is possible and even probable that secondary features were added. In the struggle between book and newspaper with their two different motor effects, auxiliary associations may have been stirred up to aid the one or the other or both sides. The longer the rivalry went on, the more I may have thought of the advantages and disadvantages, of the comforts and of the displeasures, of the scholarship which I gain from the one and the politics which I learn from the other, and finally ideas of my principles and of my moral obligations may have found their way to consciousness and may have helped to break open the channels for the discharge into the one direction.

The essential part in this rivalry was the process in the centrifugal paths, and that throws light on the whole situation. We must take it for granted that even where such rivalry does not exist and only one idea of action is before us, the more conscious processes are not the only important parts. In consciousness we find nothing but the anticipated idea of the end and the perception of the movement which leads to it. Everything else which happens in the

field of awareness is auxiliary, but not essential. But there is evidently one other essential part, only it lies outside of consciousness. The anticipated idea must be more than a mere association; it must be an idea plus such an influence on the whole brain setting that the action toward a definite goal is prepared. This effect of the idea of an end on the setting of the nervous centers is usually described as *its determining tendency*, and this phrase serves well as long as we keep it *free from any purposive meaning*. It is a strictly causal process. The idea does not aim toward the end, but it is a picture of the end, and its influence outside of consciousness is an automatic reaction.

It is easy to understand how the individual acquires this complex organization in which actions are preceded by the ideas of their ends. This is certainly never the starting point in the growth of the child's mind. The beginning is a disposition in the brain to respond to impressions with simple adjusted reactions. The infant answers the sweet milk immediately by a sucking movement, and as the experiment has shown, reacts on ammonia by face movements of rejection a few minutes after birth. All the early movements, grasping what touches the hand, following the light with the eyes, withdrawing from the painful, pressing toward the pleasant, and so on, result from inborn connections. They are not mere mechanical reflexes without consciousness like the breathing movements, but they are not will actions either, as the consciousness of the effect does not precede the actual movement. No doubt the imitation impulse also has this immediate character.

Each movement, however, produces kinesthetic sensations. The consciousness experiences, accordingly, at first the stimulus, and after that the perception of the movement process. This movement sensation becomes associated with the impression, and the next stage must be that the impression awakes a reproduction of the movement sensation before the action is performed. This would mean that

the bodily movement is anticipated in consciousness before it is carried out. But from this second stage the mind passes on to a third. The two associated states, the impression and the movement sensation, fuse into a unit with the result that the motor process which was originally stirred up by the impression becomes also the effect of the kinesthetic sensation. Hence the idea of the movement produces the movement itself. The kinesthetic sensation, however, is not the only sensory effect of the movement. It also produces external changes, sounds of the voice which can be heard, displacements of objects which can be seen, approach to or rejection of things which can be felt. The perception of these end effects passes through the same two stages. They also come to be anticipated, and finally to be starting points for the movements themselves. The idea of the end to be reached sets into action all the psychophysical processes which lead to the realization.

The fundamental importance of this anticipation is clear. As long as the motor responses are automatic, the brain has no opportunity to check the consequences by inhibiting the action. But as soon as the stage is reached at which the outer situation awakes the idea of the end responses before the movement sets in, everything is changed. This idea of the effect can be associated with all its consequences. It may stir up the feeling that it is undesirable or even dangerous, that it conflicts with other plans or with our principles. Any one of these feelings and ideas would suggest the ideas of opposite actions. Several possible end actions are then anticipated in the mind. They enter into rivalry. The idea which gets the strongest support from ready associations and from the preparedness for the action will be victorious. The fact that an idea of the end precedes the action becomes in this way the real condition of our responsibility. Only in this case can the movement be accredited to the total personality with all its acquired dispositions and its experiences. The action with the preceding idea of

the end is really our own action and gives us that feeling of personal inner activity which characterizes even the most rudimentary form of will, and which comes to its fullest growth in the action of choice among different ends.

The experimental psychologist can study its details in the miniature will deed which the reaction experiment of the laboratory involves. The simplest laboratory arrangement would be this. The subject expects the flashing of a light and is to respond to it as quickly as possible by pressing an electric key. The time from the light stimulus to the key movement is about 180 thousandths of a second measured by an electric chronoscope. But if the instruction is to anticipate in the mind not the coming of the light, but to concentrate the attention on the movement to be performed, the time sinks to perhaps 140 thousandths of a second. The anticipation of the kinesthetic sensations has opened the channels of discharge and removed the resistance so fully that the light excitement shoots into the muscles with much greater rapidity. If instead of one light impression, one of two possibilities is presented, a red or a blue light, and only the red one is to be responded to, while the blue is to be disregarded, the reaction for the red comes nearer to 300 thousandths of a second. And from such simple starting points the experiment may lead to more and more complicated arrangements by which the inner action can be analyzed through the study of the varying times needed for the responses.

Complex Actions.—As soon as the various ideas of ends lead to the fitting movements, the material is given from which the mind can build up the highly organized will structures. The mind masters the complex task by resolving the process into its parts which have to coöperate. At first each part must be willed; that is, for each the idea of the end must be associated with the fit response. By repetition this connection must become automatic, until it is finally subordinated to the idea of a more distant goal. The will action of writing or of typewriting or of piano playing involves the training for many simpler actions,

which at first had to be true will actions, but which became mechanized so that the idea of writing a word with the pen or with the machine or of playing a melody is in itself sufficient to bring the whole set of appropriate nerve centers into activity. *Everywhere we start with the automatic movement, develop it into the will movement, organize a number of them into more complex will movements, and repeat the combination until it becomes itself habitual and thus an automatic movement at the service of more remote will ends.*

The strongest force in this development is the influence of the pain and pleasure feelings. The painful impression is the most definite starting point for an immediate reaction of withdrawing or of rejecting, and the pleasure the most definite source of the movement by which the impression is made to continue. Correspondingly the pleasure and displeasure in the more remote effects of actions furnish constant aid in the organization of the will aggregates. Yet as the eyes follow any source of light and the head turns in the direction of a sound, and the hand responds to a touch on its palm without any special feeling of pleasure or pain, it may be said of the whole development from the lowest to the highest forms that the reactions may follow from any idea of an end without involving a characteristic feeling tone. The feeling helps and regulates and will be ultimately the strongest factor of decision, but no small part of the routine of our life consists of will actions in which the idea of the end is effective and determines the setting of the brain centers without any conscious feeling accent.

We are accustomed to report still another class of actions, the instinct actions. They are usually treated as a new mental type in addition to reflex actions, automatic actions, will actions and choice actions. Yet have we really a right to treat the instinct actions as an additional class? Ought we not rather to acknowledge that from a psycho-

logical point of view they offer no new features? They may be automatic actions; they may be volitional actions; they may even be choice actions: and it is a secondary aspect which is considered when we set off certain actions as the results of instinct. An instinctive action is one in which *the ends that precede the action in consciousness are not really the final ends of the whole action*. But if this characterizes the process, it is evident that it is the outside spectator who decides what end is to be acknowledged as final and not the experiencing subject. The acting individual experiences a stimulus and a reaction, that is, the typical form of his automatic reactions; or he experiences the stimulus, the idea of an end and the reaction, that is, the typical form of his will actions. And now the outsider, the scientist, comes and says that this automatic action served a useful end which was not in the mind of the individual, or that the will action, in which ideas of end were in the mind, served still other more distant ends.

In both cases the psychophysical mechanism produces unforeseen effects. But psychologically this reference to an outlying end does not change the character of the automatic or volitional experience. If I am thirsty I drink water to discontinue my unpleasant feeling of thirst. Psychologically this stands in the rank and file with any automatic reaction or will reaction by which I remove an unpleasant feeling. Physiologically I may recognize that this drinking of water is very useful inasmuch as the thirst feeling was only an indication that there was too little liquid in my arteries and that I needed additional fluid for my health. I may call the impulse to quench my thirst instinctive, because it serves that ultimate end, which I did not consider in drinking. But as a psychological experience the thirst reaction is not changed.

The sexual instinct serves, from a higher point of view, the continuation of the race, but as a psychological experience and as a psychophysical process the sexual reaction is

an automatic impulse in response to sexual feelings, controlled by the desire to continue and heighten them. The way instinct may serve the individual in training him for work like the kitten which catches the spool does not represent another kind of action because the biologist is able to connect this automatic response with the later need of the cat to be able to catch the scampering mouse. Nor does the child when he seeks the pleasures and joys of running and jumping and kicking and playing ball, have a different experience because the sociologist recognizes the helpfulness of these actions for the skillful and courageous behavior of the future man.

Whether the biologists have studied the instincts of animals. The more apparently mysterious ones of insects or birds they have always found that the actual operation can be analyzed into simple automatic responses and feeling reactions. There is no subconscious idea of the final end. The responses are direct reactions on external stimuli or on internal bodily irritations. The bird builds its nest or flies to the south in the fall, the ants heap up their anthills, and the bees build their hives without doing more than going through a chain of automatic reactions, the effect of the one action serving as stimulus for the next. If hindrances are artificially introduced, the same automatic reactions may lead to destructive results, and the result is even so here where exceptional conditions make it useless or dangerous. The fact that animal and man are born with inherited dispositions through which such automatic and voluntary reactions are favored as serve the conservation of the individual and of the species, is strictly biological. The instincts do not introduce any new type of psychological experience.

It is usually claimed that the instincts are much more numerous in animals than in man. But this is hardly correct. The actions of the animals, especially of the insects and of the crustaceans, are more uniform, because they live

under more constant life conditions, and the final biological ends can therefore always be reached through the same automatic reactions. The larger the compass of life conditions to which the individual must adjust itself, the greater is the flexibility needed to adjust the responses to the surrounding in the interest of the ultimate ends. The reaction must be more variable and must be preceded by more complex ideas of immediate ends. In the highest forms the response must involve all the transactions of intelligent thought. But even in those most variable, most flexible and most complicated forms, the ends before the mind of the acting individual are usually not the final aims with which biological sociology may connect them. Man in his volitional intelligent action serves ends which lie beyond the immediate interest of his intelligence, as much as the ends of the child's action lie beyond his immediate conscious experience. From this higher point of view such intelligent action of the will is just as much instinctive action. We may serve our life as a whole, while we think that we are selecting the action to serve the desires of the hour, and we may serve mankind, while we believe that we are serving ourselves.

Attention.—If the experience of inner activity depends upon the consciousness of a change in ourselves preceded by the idea of the effect, it cannot make a difference whether the change which we perceive is a movement of our body or the shifting of our ideas. If we try to remember a forgotten name and it appears in consciousness, or if we try to solve a problem and the solution is finally reached, a change is going on of which the effect is anticipated, and we feel it as our inner activity just as much as if the end were the catching of a ball. Memories or imaginative ideas or general ideas may arise by mere association without any preceding consciousness of an end. Our remembering, imagining and thinking is then involuntary. But our memory is often, our imagination still more often, and our

thinking almost always, voluntary in its character. The witness guides his memory, the artist controls his imagination, the scholar masters his thought.

We will consider first the act of attention. Any content of our consciousness can become the object of our attention and in every case the attention itself is felt as an inner activity. This seems to be contradicted by the traditional separation of voluntary and involuntary attention. We give our voluntary attention to the words of a friend to whom we listen, but our involuntary attention to the noise of an explosion which interrupts the conversation. The voluntary attention is certainly felt as an inner activity, but does the involuntary not lack this activity character? It seems passive and not active. These terms are misleading. The so-called involuntary attention is felt no less as an inner activity. Only the motives for this inner activity are in the two cases different. If something striking or sudden or very intense or very different from the background or very familiar among unfamiliar surroundings comes to our perception, the inner activity awakes immediately, while in other cases associated ideas or feelings lead to it. We may be forced into that inner activity and may even accompany it with the feeling that we should prefer to direct the attention in another direction if we could, and yet wherever it is directed, it remains distinctly our own activity.

What is the aim which is common to all mediate and immediate processes of attention? Perhaps we might characterize the end most briefly by saying that we *turn our attention to an object in order to get more of it*. This indeed covers every possible case. Something is in our mind, but it is vague, indistinct, obscure, or in a form in which it is unfit to serve as foothold for an action, or expressed in terms in which no associations, no words, no further thoughts can be linked with it, or in which it would not stick to memory, or in which its consequences do not appear.

We want to get more of it, we want to recognize its details, we want to have a fuller impression of it, we want to see those aspects which allow an adjusted response, we want to secure those elements in it which suggest definite associations and thoughts, we want the whole where we had only a part, the clear where we had only the vague, the expressed where we had only a hint.

We may discriminate four processes which are combined in every full act of attention. First the content becomes more *vivid*, that is, it impresses itself more strongly on the mind. This brings with it an increase in clearness. The content stands out more distinctly from the background and its various elements become more sharply separated from one another. But the vividness and not the clearness seems to be the primary change. This increase of vividness is certainly not identical with an increase of intensity. The more intense will have a greater chance to draw our attention and to become vivid in our mind, but the directing of the attention toward the faint impression does not ordinarily make it more intense. We may turn our attention to any instrument in the orchestra without in the least changing the relative strength of the tones. The experiment can show that if we compare the intensity of two successive impressions one of which is observed with attention, while the other is noticed in a state of distraction, the strength of the attended one is not overestimated. The second characteristic feature of the process of attention is that the objects not attended decrease in vividness. Again it is not a question of a decrease in intensity. They lose their impressiveness and therefore they become less clear, less distinct; they fade away and may finally be entirely *inhibited*. Not only memories and thoughts are suppressed, but the sense stimuli, too, become ineffective. Our attention either to the book in our hand or to the plan in our head may cut off the piano playing in the neighborhood, the

ache in the sore finger and the memory of an engagement for the next hour.

The third factor consists of the mental and physical *activities* which start from the attended perception or idea. Impulses to bodily movements, trains of thought, associations and feelings, develop from the attended object, while everything not attended loses its hold on our actions. The content on which the attention focuses thus becomes the center from which all the further psychophysical developments irradiate. And fourthly, the body adjusts itself to the center of attention and this adjustment sends kinesthetic sensations to consciousness. When the attention is directed to an external object, this bodily reaction involves above all the adjustment of the sense organs; a sharp fixation, the movements of listening, sniffing, deliberate movements of the tongue, and searching finger movements.

Moreover, the end organs are held in fixed positions in order to secure the fullest possible impression. The neck stiffens, the arm and hand muscles are strained, the respiration is regulated, the muscles of the forehead are contracted; in extreme cases the whole body is cramped. When the object is not external these movements of adjustment may nevertheless play a considerable rôle, and it is doubtful whether they are ever entirely absent. Certain contractions in the eye muscles or in the neck or in the forehead or in the chest result as automatic reactions where no new perception is involved, and if the movements themselves are absent, at least reproduced kinesthetic sensations readily enter into consciousness. These bodily sensations are especially fit to reënforce the feeling of personal activity in the process of attention.

These four processes are not the result of attention, but are themselves the attention. Each may be present in any degree, and the whole complex process will change greatly with the character of the object, but the essentials remain

same in every case. The question can be only whether these four factors are simply in a chance combination or whether they belong necessarily together. Our discussion of inhibition has answered this question fully, and we affirmed most earnestly the second alternative. The vividness of one content of consciousness and the inhibition of other contents are two sides of the same process. Moreover, they are most intimately connected with the reinforcement of the actions and thoughts related to the vivid and with the suppression of the actions and thoughts related to the inhibited content. The processes of bodily adjustment are themselves only parts of the movements by which the psychophysical system responds to the attended object.

As long as we do not recognize the interrelation of these four factors we cannot understand why certain elements are inhibited, while others are reinforced. As soon as we connect both with actions we understand that the antagonistic actions exclude one another, and if we accept the views of action theory, we see that the enforcing of one action not only secures the vividness of the corresponding idea, but inhibits at the same time the opposite action and suppresses by that the ideas which would lead to that opposite train of behavior. The suppressing of these counteracting ideas reinforces again those which lead to actions and thoughts in the other direction, this increases their vividness, and so we move in a complete circle by which the psychophysical system secures the fullest possible effectiveness of the attended impression or idea. In the case of the immediate attention the character of the stimulus or the feeling tone of the idea breaks open the channels of charge; in the case of mediate attention our associations prepare the centrifugal reaction and by their influence on the whole setting of the psychophysical system they produce an attitude of readiness by which the otherwise indifferent idea or impression becomes the center of influence.

This associative preparation may precede the perception. If we show in the laboratory cards on which a dozen little forms, squares, circles, triangles, crescents are given in various colors, for a very short time, and instruct the observer beforehand to give his attention only to the colors, he may see the yellowness of the triangle but not its shape; and if we ask him to give his attention only to the form he may know that it was an ellipse, but not that it was green. A full preparatory adjustment of attention demands one to two seconds. The inner setting for a particular kind of attention is the result of our whole inborn disposition and our training. Every acquired habit of action and thought must influence the distribution of open and closed channels of discharge. Our whole education decides not only what perceptions and ideas we may select as centers of our mediate attention, but it decides no less what impressions and thoughts will have power to fascinate our immediate attention. A dozen people may read the same newspaper, and the attention of each may be drawn to another column.

The Thought Process.—The attention to an experience is the inner activity by which we get more of it in order to gain a new starting point for our psychophysical reactions. This process of getting more of it may be developed to any degree of complexity. One of the most important cases is that in which the attended object becomes enriched by all the relations which our mind can add as the result of earlier experiences. The final result of the inner activity is then practically a new experience which gives a new basis for mental and bodily response. In this case we call the total process thinking. *Every thought is psychologically a prolonged attention process.* The starting point is an experience which does not allow us sufficient hold for an internal reaction. We do not know how to behave with regard to it. Now we try to get more of it with the aim of securing such aspects of it as allow a fit re-

ponse. The object may be a single thing or a whole situation or the total universe, or it may be a relation of things, symbolized by a word, or a relation of abstract ideas. Anything can be the starting point for our effort to reshape the experience under the influence of earlier experiences and under the control of the idea of the needed response.

Such thinking may be unformulated. If we meet a dangerous situation which demands an action, all the consequences which may develop in the next few seconds may be considered in the light of earlier associations and the immediate impression may be enlarged into an entirely new complex, which forces us to the appropriate action; and yet this whole thought process may not have involved any words. The physician who thinks about a symptom of the patient and makes his diagnosis of the disease in order to give him the right aid, may think exclusively in the images of earlier experiences in the hospital without introducing word thoughts. All practical managing and arranging demands much thought, and even very concentrated thought, with many way stations before the end is reached; and yet all may go on without words. The formulated thought, which moves from premises to conclusions contains the earlier experiences of the individual or of mankind in positive and negative judgments, which allow the knowledge of civilization to be made serviceable to the richer unfolding of the given situation. But however complicated the thought process may become, the essential point remains the anticipation of the end before the enlargement of the situation occurs.

The explanation of the process must naturally move along the same line on which the explanation of attention proceeded, as fundamentally the same facts are involved. We anticipate the final situation, on which we are able to react. This anticipation gives us the feeling of inner activity. But this anticipation is not only a conscious ex-

perience, but above all a new psychophysical setting. The attended idea unfolds through the various thought associations under the steady influence of this anticipated setting. Every group of ideas which harmonizes with it becomes reënforced, and the antagonists which would interfere with the setting remain inhibited. The end situation, which allows action, thus precedes the thought as an idea with determining tendencies, not in a purposive, but in a strictly psychophysical sense. The most powerful element in the thought movement lies in *this preparatory setting which is itself not represented in consciousness*. The truly conscious elements of the process are therefore rather secondary. Images, kinesthetic sensations, above all words, may accompany these irradiating brain processes with their inhibiting and facilitating effects, but the preciseness of the thought and the richness of elements which enter into the process will depend very little upon the full-fledged conscious representations and symbols. A world of experience may be condensed in a thought of which the various stages hardly enter consciousness and in which only bits of memories or of formulated judgments combined with kinesthetic impressions appear. The word which we speak as an answer to a question or the action which we perform as final decision in a complex situation may be the first conscious notice to us that the process of thought is completed.

In the laboratory experiment we can trace these various developments by creating miniature situations which demand a reply, a decision, a conclusion, an action. Every demand of this kind is a test of the individual intelligence. Such thought processes in the laboratory or in practical life may leave the selfobserving subject with the feeling that he experienced the thought but that no contents could be found in his consciousness. His introspection seems fruitless. This has often led to the misunderstanding that there must be mental states which are incomparable with

the sensations, feelings and their reproductions, imageless thoughts which we know without finding them as objects. This reference to a mental thought which we know without finding it in consciousness is a slipping back into purposive psychology, where the thought comes in question as a meaning only. In causal psychology we must acknowledge that the essential parts of the thought transaction are not mental experiences at all. Those fringes of memories and words give us a hint that some processes are going on in our psychophysical system, and above all the definite anticipation of the end situation gives us the characteristic feeling that it is our own activity, but the fundamental process is only physiological.

If the end situation which we prepare is not a practical attitude, but an emotional one, the effort to get more of the attended object and to enlarge it by reproduction is no longer bound by the objective relations of the world. What is needed then is not thought, but imagination. A thought stands in the service of reality. Its correspondence to the world is its truth, and no action can be reasonable if it is not adjusted to the real world of experience. But if the end is the satisfaction of a feeling, the inner movement which transforms the situation and enriches it is independent of the rigid laws of nature and may move in the ideas of the fairy tale and in the fancies of the artist. But as the final end, the fulfillment of a particular emotional demand precedes these imaginative changes, too, the whole artistic production may be felt as a voluntary inner activity as much as the truth-bound thought of the thinker.

CHAPTER XIV

INNER STATES

Pleasure and Displeasure.—Throughout we have been separating artificially the experiences which are blending in the unity of our life. No other way was open to us, if we were really to describe and to explain them. We had to deal with the perceptions and ideas as if our awareness of present and past and fancied objects could be detached from the mental activities which respond to them. And we had to speak of the inner activities as if they were isolated in consciousness and separated from the ideas. But the most unnatural frontier line which we had to draw and which we did not cross was that which separates both ideas and activities from the inner states. The simplest impression may blend with our state of satisfaction or dissatisfaction; the simplest memory with our state of enjoyment or regret; and an abundance of emotions and sentiments may surround our ideas. At the same time our inner states decide our actions. Our enthusiasm and our anger, our grief and our joy, control our attention, our thought, our involuntary and voluntary acting. Our moods and passions, our intellectual and moral inner settings, are responsible for the steps which we take. Our inner states thus mediate between the world of ideas and the world of inner action; even our indifference is a state upon which our inner behavior depends. We must now characterize this central section of our inner life, which has so far profited least from the scientific methods of modern psychology.

The most elementary inner state which we can find in

consciousness is the simple feeling of pleasantness or unpleasantness which is attached to simple sensations. But from the beginning we must not forget that the organic pain or lust is just as much a sensation as white and black or sweet and bitter. The pain sensations are always unpleasant, the lust sensations always pleasant, but they themselves are neither unpleasantness nor pleasantness. We can observe the state of discomfort produced by a foul smell sensation just as much as that caused by a toothache. The ache in the tooth is a part of our perception as well as the sensation of the odor. It makes no difference that its source, the tooth, is in our body, while the source of the smell is without. Both are objects of experience, while the displeasure in both is a subjective state.

If the subjective character of the feelings is emphasized, that does not mean that they are capricious and beyond scientific foresight. The inner states of our self are controlled by laws as exact as those of the sensations. It is true the actual feelings are to a high degree subject to personal conditions, to chance habits and passing influences. The same taste sensation may be very pleasant to a hungry man, and very unpleasant to him when he has eaten too much. But this may also be said of the objective sensations. The colored light impression depends upon the fatigue of the retina, upon the preceding experience of other light impressions and upon similar conditions in the perceiving individual. On the other hand, we may expect the same regularities in the appearance of a pleasant or an unpleasant feeling which we know in the sphere of sensations. There are personal idiosyncrasies by which certain tastes, for instance, are disagreeable to some, while pleasant to most others, but these are personal exceptions like the seeing of the colorblind.

Normally we can foresee that a slight bitter taste will be pleasant and an intense bitter taste unpleasant, that a tickling impression will be agreeable and a nerve injury

extremely disagreeable, that a cool impression will be pleasant and a very cold one unpleasant, that a relief from thirst sensation will be agreeable and a sensation of nausea disagreeable. Moreover, we can trace exact relations between the quality and intensity of the stimulus and the character of the feeling. Each taste sensation, for instance, begins with a very mild pleasure, ascends to strong pleasure, sinks to a state in which pleasure and displeasure seem mixed, and with still greater intensity becomes decidedly unpleasant. But while this phase of pleasantness covers a large part of the scale in the sweet impression, it corresponds to a very small part of the scale in the sour impression, which with increasing intensity sinks very quickly to the unpleasant. Moreover, the character of the feeling depends upon the duration, upon the spatial extension, upon the alteration, and most of all upon the combination of the stimuli.

This law-abiding regularity of the feelings appears only natural as soon as we consider the function of the inner states from our biological point of view. The pleasantness or unpleasantness leads to the most significant reactions of the individual. It represents the needs of the organism. If these needs changed from individual to individual and from minute to minute, it would indeed be impossible to foresee which feeling effects would arise. But the fundamental human needs remain to a high degree constant. Certain temperatures are helpful and others are harmful, certain odors are characteristic of wholesome food and others of poisonous or unclean, infectious substances; moderate excitement of the muscles is stimulating to the organism, painfully fatiguing overexcitement is injurious. The more closely related to the physical and chemical conditions of life the stimuli are, the more constant are their feeling effects.

The Physiological Basis of Simple Feelings.—What is the underlying physiological process of this simplest feel-

ing state? What is added in our psychophysical system to the process of a slight bitter excitement and of a strong bitter excitement, when one appears pleasant and the other unpleasant? We have a definite basis for a physiological theory if we observe the bodily reactions connected with the sensory pleasure and displeasure. They indicate clearly the antagonism of the feelings themselves. If the stimulus is pleasant, the movements tend to make it go on; if it is unpleasant, the movements tend to stop it. The stimulus continues, if we actively approach it or if we passively yield to it, and it ends if we move away or throw it off. Two groups of antagonistic movements are evidently especially characteristic. If the stimulus is disagreeable, the organism reacts by a contraction of the flexor muscles. It is a cramplike shrinking of the body, a tense strain. If the impression is agreeable, the organism expands, and the extensor muscles are active.

It is the same opposition of movements which can be traced throughout the history of animal life. We saw how the amœba contracts under the influence of the dangerous stimulus, and expands under the influence of helpful stimuli. If the infant is put into a lukewarm bath, we see these same useful expansions, and if he is held in a bath too cold or too hot, we see that general contraction. Throughout life the approaching and the withdrawing movements are the leading reactions to pleasant and unpleasant stimuli, and under natural conditions the flexor and extensor contractions are their chief factors. Many other secondary centrifugal effects can be traced. The agreeable and the disagreeable states produce opposing reactions in the respiration, in the rapidity and character of the pulse, in the size of the small blood-vessels, in the gland activity, but whatever their biological importance may be, those contractions of approach and withdrawal must stand in the center as they alone have immediate practical bearing.

If every useful stimulus from the first experiences of the infant produces one set of movements, and every harmful stimulus an opposite set of movements, it is evident that the perception of the one must be always accompanied by one group of kinesthetic sensations and the other by an opposite group of kinesthetic sensations. An immediate association must arise, and the satisfactory stimulus must awake directly the reproduced movement sensations of approach, the disturbing stimulus the reproduced movement sensations of withdrawal or rejection. But if every helpful stimulus, from the first warm milk which produces the sucking movement, is accompanied by certain kinesthetic sensations, would it not be the simplest interpretation to claim that the feeling of pleasantness is itself the associated reproduction of these approaching movements? The feeling of unpleasantness would then be the reproduced sensation of the withdrawing movement. Our withdrawal or approach may be a real will act; in that case the kinesthetic sensations which arise indicate simply the action. But when the same movements result automatically, their kinesthetic sensations fuse with the perception of the stimulus and give to the impression the feeling value.

Such a theory seems indeed in the best harmony with the objective facts. And yet it can hardly be accepted as the whole story. It is on the same level with those theories of space and time perception and attention which we discussed before. Those who claim that the space perception results from kinesthetic sensations of our eye movements and limb movements surely point to essential elements in the situation. Yet we recognized this phase as incomplete, and we insisted that these actual kinesthetic sensations, while they enter into space perception and attention, are after all secondary elements only. We developed a space theory and an attention theory which sought the direction value of space and the vividness value of attention not in the resulting movement sensations but in the central changes connected with the arousing of the movement impulse. The impression became vivid when the central excitement found the channels of motor discharge open; the impression became localized when the central excitement was carried into a particular movement direction; and we should now say: *the excitement be-*

comes pleasant or unpleasant, if it is starting a movement of approach or withdrawal.

As long as we feel bound to the traditional association theory, any reference to the characteristic actions would necessarily be a reference to the kinesthetic sensations. But as soon as we emancipate ourselves from the onesidedness of the association theory, we may indeed expect that the centrifugal processes themselves will alter the central excitements. In the association theory we can reckon only with a host of cells each of which has its special psychical sensation as accompaniment. In the action theory every cell can itself pass through many changes of its inner excitement through its various outgoing responses. Every sensation indeed needs reference to a special cell, because only in this way can we explain the associative interplay of the reproduced sensations. We can understand how one cell excites another cell through associative paths of least resistance, while we could never understand why the same cell should go from one stage to another stage through its own activity. But the pleasantness or unpleasantness is not such an independent element which enters on its own account into the associative mechanism. The feeling can disappear without the disappearance of the sensation, but if the sensation ends, its feeling tone is somehow destroyed. We must believe, therefore, that the primary process upon which the pleasantness or unpleasantness of the sensations depends is really a part of the sensory excitement itself.

Yet we have no right to neglect those secondary factors, the reproduced kinesthetic sensations. We recognized their importance in space perception and attention too. They furnish us a true experience factor in our consciousness of direction and localization and make us aware of our inner activity in attention. They are surely the resounding elements in our feeling tones, too. The pleasantness and unpleasantness receive their very color from our consciousness of the action through which the stimulus is continued or is discontinued.

The Manifoldness of Feelings.—We have spoken of pleasure and displeasure only. In recent times it is a favorite topic of discussion whether we really have the right to confine the feelings which are attached to the sen-

sations to these two. It has been claimed that a single tone or color may be accompanied by a feeling of *tension* or *relief*, or by *restlessness* or *repose*, or by *excitement* or *depression*, all of which may be combined with pleasure or displeasure, or may be entirely free from either. We should have accordingly a manifoldness of feeling tones. Others hold that all these effects are not true feelings, but simply additional organic sensations by which the pleasure and displeasure may be shaded. Another deviation from the orthodox theory is given when the pleasure and displeasure themselves are not acknowledged as uniform states. It is indeed often claimed that each kind of stimuli brings its particular kind of pleasure or displeasure. The satisfaction in a taste and in a sound are not the same state. Thus we might have an unlimited number of pleasure and displeasure qualities.

These points of discussion appear in a new light as soon as the relation of the inner states to the motor impulses and psychomotor settings is considered. If our feeling of displeasure and pleasure really depends upon the motor excitements for outer actions the central processes must be shaded in innumerable ways. Both the centrifugal innervation and the central association of kinesthetic elements must be different when we fixate a color or when we listen to a sound or when we approach a source of odor, when we reject something bitter on our tongue or something hot in our hand. Moreover, this theory explains not only the manifoldness of pleasures and displeasures, but also justifies the claim that other inner states are to be characterized as true feelings, too. No doubt those who claim that the feelings of excitement or relief or repose or restlessness are characterized by organic and kinesthetic sensations are perfectly right, but that is no argument against grouping them with pleasure and displeasure, as we saw that kinesthetic sensations are a part of them, too. If the pleasant and unpleasant states depend not only upon these organic

sensations, but still more upon the motor impulses themselves, the same may be expected of those other states.

The restlessness or excitement which shades the feeling tone of an impression may well be understood as the accompaniment of central cell changes which result from the release of excited or restless motor impulses. We can have, therefore, just as many kinds of feeling states as we have ways of reacting, and yet it is not by chance that we always return to pleasure and displeasure as the fundamental feelings. The reactions which make the stimulus continue or discontinue are practically so much more significant than all the others that their corresponding feeling tones must be acknowledged as predominant. Moreover, this central fact that the impulse leads toward the continuation or the discontinuation of the stimulus must be felt as more important than the varieties of special movements by which this result is secured. It is therefore only natural that we usually speak of pleasure and displeasure feelings in general and ignore the fact that they appear as a thousand different pleasures and displeasures according to the thousandfold forms of reaction.

Emotions.—The motor theory helps us also to find the transition from simple feelings to emotions. In the complex emotional states the intimate relation to the centrifugal processes is so evident that no description of emotion can leave out the actions of muscles, blood-vessels and glands and their conscious effects. Anger and joy, fear and hope, enthusiasm and discouragement, delight and disgust, gaiety and depression, are marked by characteristic actions or inhibitions of actions, by tensions and relaxations, by centrifugal effects like crying and perspiring, blushing and growing pale, trembling and laughing. These are the complex responses to complex situations, but in principle are not different from the simple reactions to the simple sensations. The explanation of the actual inner experience must therefore move along the same lines.

Fear and anger are not complete in themselves before the unnatural breathing and the quick heartbeat and the trembling and the cramping set in. But the influence of these centrifugal parts can be and probably must be interpreted again in both ways. First we become conscious of the sensory effects of such bodily reactions. We cannot grit our teeth and clench our fist and frown and breathe deeply without perceiving these changes in our kinesthetic and organic sensations. But secondarily the central impulses to these contractions or to the gland activities cannot start in the brain cells without changing the setting of those sensory centers from which they were stimulated. We see a snake and run away. The running gives us sensations without which the emotion would not be complete. But the more essential part is that the impression of the creature is frightful in itself. The transition of the sensory excitement into the vehement impulse to run must have produced an intracellular change in the excitement itself.

It would be very onesided, however, to consider the influence of the reactions, even in this expanded form of the theory as the only characteristic traits of the emotions. Both the ideas from which the emotion starts and the reactions through which it develops control the play of associations. A rush of ideas overflowing consciousness or a complete inhibition of associations or the predominance of associations with special feeling tone, may shade the emotional state. Exactly the same movements, therefore, may enter into very different emotions, and yet produce contrasting effects on account of the different ideas which are combined with them. We may run forward as a part of our fear of an explosion behind us, and we may make the same forward movement in an enthusiastic run for the ball. The consciousness of the forward movement is in the one case accompanied by the idea that the distance between us and the danger is becoming greater with every

step, in the other case by the idea that the distance between us and the desired object is becoming steadily less. It is a characteristic combination of ideas and psychomotor results which gives the richness to our emotions.

Their biological value is not always clear, and it would be artificial to seek actual advantage for the individual in every emotional excitement. The theorists often take refuge in the hypothesis that some groups of these organic responses and the corresponding inner states are the late survivals of animal behavior or at least of the useful habits of primitive people. More frequently we probably have to count with the simple overflow of excitement which is in itself not adapted to any purpose. But the typical emotion is still to-day decidedly useful. *The emotion secures for the action what the attention secures for the ideas.* It is a resetting of the psychophysical system by which the mind is focused on one point. Our attention brings one idea to fullest relief and inhibits all the antagonistic ideas and suppresses everything which leads away from the attended center. The emotion likewise makes all the resources of the individual serviceable to one end. Every other impulse to action, every diverting desire and idea of any end becomes inhibited, nothing any longer interferes with the one chief impulse. The enthusiasm is not checked by cool reasoning, the desire to attack is not restrained by ideas of danger, the joy is not embittered by thoughts of drudgery. But not only the creative emotions have this biological significance. Fear is not less important for man's welfare; it is the great protective agency, and if it were not sufficiently developed to focus the mind on this one response reckless ideas and chance interests would lead us aside and would endanger us.

The physiological basis of the emotions is accordingly a complex connection of nerve centers by which a normally useful reënforcement of reactions is secured. The special actions which are needed for this effect are produced with-

out our conscious guidance. To a large degree they occur in organs which are entirely outside our voluntary control. We cannot influence voluntarily our glands or our blood-vessels, and yet their functions are evidently almost as important for the total work of the organism in the emotional resetting as the reënforcements and inhibitions of the voluntary activities. The enthusiastic reënforcement of the deed demands the increased blood supply. The most subtle mechanisms for the regulation of the blood circulation enter into action in every emotional state. If we wish to emphasize the fact that all these responses are useful, while their useful end is not known to the excited individual, we can call the whole resetting instinctive. But we must not forget that this is in no way an exceptional privilege of the emotions: every mental function, we saw, is based on mechanisms which are biologically useful.

The subtle mechanisms by which the emotional reënforcement of the useful attitudes and actions is secured are little known as yet. Recent researches both by psychiatrists and physiologists point to the great importance of the chemical substances which the ductless glands of the body pour into the blood. Physiological experiments have shown, for instance, that when a cat is frightened or enraged by a barking dog, adrenalin, the product of the small glands attached to the kidneys, appears almost immediately in the blood. The effect of adrenalin in the circulation is the contraction of certain blood-vessels and the dilation of others. In the abdominal organs the blood-vessels are contracted and the blood is forced from these vegetative organs of the interior to the limbs and to the heart, lungs and brain. In a situation in which a strong aggressive or escaping movement is needed the adrenalin production of the body thus regulates the blood supply in the most useful manner. The muscles of the limbs which are needed for the attack or the escape are well supplied, and brain, lungs and heart are prepared for the extraor-

dinary effort, while all the other inner organs by lack of blood are forced for the time to decrease their vegetative functions. This change in the blood circulation, then, becomes the cause of many secondary expressions of rage or of fear.

We have hardly the right to say that the emotion is the cause of the adrenalin production, inasmuch as these effects of the adrenalin must be acknowledged as essential parts of the emotion. On the other hand, the mere perception of the irritating or frightful object cannot possibly stimulate the activity of the adrenal gland, if there is no preceding impulse to attack or to escape. Hence we should say that the barking dog arouses in the cat first the motor impulse to a strong reaction movement of aggression or of flight, and that this excessive motor impulse works on the lower nerve centers as a stimulus for adrenalin secretion. A few seconds later the gland has done its work, has thrown its product into the blood circulation, and through the chemical influences of this substance on the nerves the true emotional process is released in the service of the intended action. Every true emotion probably begins with such a characteristic motor reaction which arouses gland activities through which the whole organism becomes reset and usefully prepared for maximum efficiency. Of course, this motor reaction may be a negative one, as, for instance, in the case of depression.

The Esthetic Attitude.—The inner states which we have characterized so far arise on the background of practical attitude. Yet the perceptions, memories, ideas, may enter our mind and find us prepared for entirely different kinds of responses, because the whole psychophysical system may be set in a different attitude. The most complete contrast to the practical is the esthetic attitude. In the esthetic setting also we respond to the world by complex reactions and corresponding to them we pass through rich esthetic feelings. But they have no reference to our prac-

THE AESTHETIC SETTING. The aesthetic attitude is one in which we do not change the world nor in which no external effects are to be expected. The sunset sea arouses our fear if we are in the practical attitude, but we enjoy the beauty of its colors if we take the aesthetic attitude. In our fear of the sea we desire it not, we do not want anything changed. Our practical life determines a general setting of the brain centers by which impressions or associations become impulses to actual movements. The characteristic preparation for the aesthetic attitude is a general setting of the brain centers by which every external response is inhibited. We do not grasp the painted form: we do not rush to seize the form in the shape.

This inhibition of actual responses does not involve a total lack of the normal motor impulses. But the contractions are held in check by antagonistic impulses, or by an inhibition of the lower centers for response. The impulse to move and to act is still internally, only it is detached from the idea of our own practical personality, as our inhibition of the motor impulses has eliminated the idea of our self. The normally awakened feeling of action as associated with, determined, and with our behavior, but with the impressions which nature or art offers to us. We feel our movement impulse as the upward movement of the column which supports the roof. Every line and every curve and every angle in the building becomes a center of activities, every form and every color in the picture is now enlivened by the excitements and impulses which arise in us, every note in the melody reaches out for other tones and looks for them, the rhythm of the poem and its rhymes are felt with the energies which are ours, and every branch in the landscape before us now has a life of its own. We associate our reactions with the elements in the landscape or in the work of art, because we have detached them from ourselves through our antipractical, esthetic setting.

Nature or art is beautiful when all these energies har-

monize, when the excitement of the one color does not interfere with that of another, when the forms support one another, when the rhythms agree, when the tones find one another. But as these energies are our own, it is ultimately the psychological harmony and unity of our own responses through which we become aware of the unity of the beautiful thing. It is the task of the artist to create his work so that the energies which he stimulates are in such psychophysical harmony. He must therefore choose such tones, for instance, as fuse, or paint his canvas so that the forms in the picture balance, or write his poem so that the ideas aroused by the words harmonize with the rhythm of the verse. He can produce these energies only if he really succeeds in suppressing the practical attitude. For this purpose he must detach his work from the interests of life and move the mind away from the world of practical experience. The frame must cut off the painting from our real surroundings and the flat canvas must show that the figures in it are not real men. Where art simply imitates life, the esthetic attitude is impossible. The unnatural white marble statue, not the lifelike, colored wax figure, creates the esthetic setting of the psychophysical system.

The detailed analysis of the esthetic process may turn in both directions; we may examine the conditions which reinforce the esthetic attitude, and we may study the combinations of elements which are in harmony with it. The experimental study has been especially devoted to this latter question. We shall trace this esthetic work of the psychological laboratory when we turn to applied psychology.

The Intellectual Attitude.—The esthetic attitude, and accordingly the inner state in esthetic experience, is to a certain degree similar to the intellectual attitude, as both seem equally detached from practical actions. The thinker concentrates his mind on a problem in the service of truth and submits to the truth without reference to his personal

liking or disliking. He takes an objective attitude toward the facts and knows that he would fall into error or untruth if his thought were guided by his personal wishes. This means that the central impulses to associations and reactions, which are controlled by personal desires, are inhibited in the process of truth-seeking as much as in the process of esthetic apprehension.

But, the ways must part here. In our enjoyment of beauty the detachment from actual life and the corresponding inhibition of practical action is the fundamental and final event. In our seeking the truth in every act of the intellect this inhibition of interfering actions is provisional and is in force only until the thought process is completed. As soon as the thought result is reached it must become the starting point for action. When we traced the process of thought as an inner activity, we recognized that it is just this end state which gives to the thought movement its character and energy. We do not act as long as we are thinking, but we think only in order to act. The securing of a new foothold for action is the real goal. We reorganize our perceptions and ideas in order to reach it, and the anticipation of the final action is the psychophysical attitude which controls the reorganizing process throughout. In every ordinary act of intelligence this fundamental *connection between the thought process and the new adjustment to the life situation* is quite evident. In the case of the theoretical scholar this connection becomes less obvious, because the thought processes have reached such complexity that they appear as independent transactions. But this is, after all, only a division of labor. The intellect takes the world as a connected whole. And this points to another contrasting aspect of truth and beauty. The beautiful object is attended to in its isolation; it stands alone cut off from the world. The object of intellectual work is never interesting in itself alone, but only in its connections. We link cause and effects, we compare the present case with

previous ones, and every true thought is a contribution to the one interconnected system of knowledge.

The intellectual attitude is thus only on its surface similar to the esthetic one. In its deeper structure it is the opposite. But the essential point is that it, too, involves a complex preparatory setting. This may be stimulated by the immediate wish to act on the basis of the intellectual result or by the mere desire for more knowledge. It is the setting by which only such combinations of ideas can become effective and only such acts of affirmation can arise as are in agreement with the totality of the knowledge at our disposal.

This setting of the brain centers is represented in consciousness by the resulting ideas themselves and by the whole series of inner responses, but we are not directly aware of the reorganization of the brain paths. The fact that we are in the thinking attitude becomes known to us by the appearance of our thoughts. I have just seen a butterfly at the window: I might have taken toward it the practical attitude of catching it for my friend's collection. I might have taken the esthetic attitude and simply enjoyed the beauty of its colored wings. But I evidently have taken the intellectual attitude, as I find that thoughts about the class to which it belongs and about the structure of its nervous system and about its reactions actually come into my mind in seeing its movements.

Nevertheless a certain inner feeling of this attitude, a certain state of reflective setting arises in consciousness too. Kinesthetic sensations may be parts of its fringes; yet it seems probable that here, too, we have to do with an influence of the changes in the centrifugal paths on the sensory centers. In any case we are somehow conscious of every variation in this setting for truth. Belief or disbelief, familiarity or strangeness, trust or distrust, doubt or certainty, interest in one line or another can shade our inner feeling of intellectual responsiveness. Each time we have evidently a preparedness for a different kind of reaction. Yet

these shadings of the inner states fuse so completely with the ideas from which our action starts that the selfobserver has small chance to isolate those elements and it is not surprising that in the experimental analysis the introspection finds very few traces of such inner states of thought, and is confined essentially to the various stages of the final thought process. It only indicates that the sensations play a very subordinate rôle in our inner states and that the fundamental character of inner states lies in the resetting of the brain processes for response and their retroactive influence on the sensory centers. We can abstract here from the inner states of the moral attitude, as this refers to the relation of man to man, and belongs in the compass of social psychology.

CHAPTER XV

PERSONALITY

The Unity of the Personality.—We studied the elementary processes of sensory stimulation, of reproduction and association, of reaction and inhibition, which underlie the complex processes of life. Then we turned to these complex processes themselves and analyzed the perceptions, the ideas, the inner activities and the inner states. But these, too, are after all not independent contents of our consciousness. Introspection shows them bound together in every true experience of the personality. We cannot add any new content, when we finally consider this personality itself; we can only speak of that perfect interplay of perceptions, memories, fancies and symbols with the feelings, emotions, acts of attention, of thought and of will.

We recognized that the causal interconnection of all these functions is made possible by the complete connection of the brain parts. No element of personal life is without such physiological foundation. The physiologists, including those who prefer to call themselves objective psychologists or behaviorists, have therefore no difficulty in characterizing the behavior of the personality as such in purely material terms. They would say that the character of personality expresses itself in the reactions in so far as the responses of the muscles and glands and blood-vessels are not mere results of the stimuli which reach the senses but are controlled above all by the after-effects of all the earlier experiences. These experiences, they would emphasize, contain not only the earlier sense excitements, but what is equally important, the earlier reactions and their con-

tripetal effects. Every afferent and every efferent excitement, every physical or chemical change resulting from the repetitions of reactions, or from the forming of association paths of lessened resistance, must count for the final effect of the personal deed. It is a trillionfold interplay of facilitations and inhibitions in the connecting structures with constant molecular resetting in the centers themselves. This resetting, moreover, must depend, as we have often insisted, not only upon those excitements which flow toward the cell body but no less upon those which leave it.

To us the physical mechanism alone cannot be a substitute for the psychophysical system. The physical part, to be sure, is alone responsible for the causal connection, but the psychical part, that is, the psychophysical process in so far as it is open to selfobservation, remains the psychologist's most immediate object of interest. *The cell mechanism furnishes the explanation, but only the contents of consciousness cause us to seek such physiological explanations.* As psychologists we had to start from the inner experiences, and only our postulate that we bring them into causal connections makes us link them with the machinery of the brain. This interest in the mental states guides us to the highest point where we can see the personality in its unity. Of course, this unity is then nothing but the interconnection of causally connected parts. We have no right to substitute a kind of teleological unity in which the subject knows himself as the same in every act, a unity which we shall find fundamental in purposive psychology. There we have to acknowledge in the personality a oneness which is incomparable with that of the objects of nature, but from the causal point of view the unity of man is not different from the unity of the tree where roots and branches and leaves are firmly interrelated. The states and activities of the individual are completely controlled by the ideas and perceptions, and themselves control the

ideas which are to arise and the perceptions which are to be admitted. This mutual interdependence is the essential feature, and the whole personality is active only where this psychophysical coöperation of all parts is normal and unbroken.

One result stands out prominently from all which we have discussed: *we cannot possibly understand the psychology of the personality by mere associative processes.* The association theory, which works only with the sensations and their reproductions, seeks in the content of consciousness far more than any introspection shows, and yet is obliged to seek everything there, because it ignores the richest part of the process, that which is going on outside of consciousness. The advocates of the subconscious recognized this weakness and insisted that only a small fraction of the life of the personality lies in consciousness and that the larger part is below the level of consciousness. There the subconscious ideas and reminiscences, wishes and habits, emotions and volitions are incessantly at work and decide on the conscious thoughts and activities. We saw from the start that such a theory of the subconscious is a poor makeshift, contradictory in itself, and unfit to render the aid for which it is constructed. But its negative claim is certainly correct. The few contents which enter into consciousness itself are never sufficient through their associative play to explain what really happens in the personality. An answer which we give to a question may contain a most momentous decision in which all the principles of our personality express themselves, and yet it may find words before any ideas or arguments have really entered our consciousness. Our conscious associations are often only the loose appendages to the actual events.

When the theory of associationism has been recognized as entirely insufficient, and the theory of a subconscious causal mechanism has been rejected for good reasons, one

group of thinkers, especially the philosophically inclined ones, tends to turn toward a purposive theory. A higher subject which through its own independent decisions has an automatic power over our inner life becomes a convenient *deus ex machina*. But this, of course, is only a falling back to the theory of the purposive soul which must be discussed later. Here we cannot escape the demand to have a real system of causes and effects and no miraculous intrusions into the causal interplay can help us.

We know that only a physiological mechanism can furnish such an explanation, and the failure to explain all by the psychophysics of merely associative processes discourages us no longer. We have recognized that associationism leaves out the most important part of the physiological process, namely the complex setting of the cell connections and the resulting reorganizations of the cell mechanisms themselves. In our action theory these physiological psychomotor processes stood in the foreground. They appeared not only responsible for the development of the actual processes, but fundamental also for the shading of the sensorial and ideational states themselves. Only in this way does the personality become a true unity in all its parts. Motor functions are now not only externally attached to the ideational ones, but are themselves the causes for the vividness of the ideas. *The personality's thinking is as much the product of his actions as his actions are the product of his thought.*

Selfconsciousness.—The mere conscious existence of the ideas, feelings and actions which constitute a personality is in itself not the consciousness of personality. The idea of one's own self must be superadded, and this self-consciousness may take various forms. The infant has impressions and feelings and impulses too, and is early guided by preceding experiences. He has accordingly from the standpoint of the psychologist the traits of a personality; yet the infant has not selfconsciousness. The

idea of his own personality has not entered his mind; he is not conscious of the unity in his personal experiences. He plays with his feet just as he does with a rattle, and certainly does not experience his mental states as an inner possession. Selfconsciousness is a later product, which is surely not gained by the mere possession of conscious experiences.

What are we really conscious of in our selfconsciousness? We know ourselves. A philosopher might add: we do not know anything but ourselves, because whatever we perceive in the world and whatever we remember is, after all, our own perception and our own memory idea. We see the houses and trees, but that means we have visual sensations and these we have in ourselves: they are a part of ourselves. Such an argument may be perfectly sound from a philosophical standpoint, but this standpoint is evidently not that of ordinary life, and we must ask first what knowing ourselves means in the experience of the day. If we start from our practical experience, we know ourselves as one of the innumerable objects of which we are conscious. We know the table and the chair, the dog and the cat, our neighbor and ourselves. This knowledge of ourselves began psychologically just like that of other things in the world. We perceived ourselves, that is, we perceived our own body by groups of sensations.

In the world of objects which we perceive, that one object, our own person, gains an incomparable rôle. It cannot be otherwise. First, it takes the *central place*. This body of ours is present in every scene which we perceive. Whatever the setting of our impressions may be, in every room and in every street, we are present. But the child recognizes the importance of his body no less by his feeling sensations and by his actions. If anything too hot, too cold, too hard, too pointed, touches the skin, the resulting pain emphasizes the prominence of the body. At

the same time the actions of the body carry out the desires. The desired ends are automatically realized by the movements of the arms or of the lips. The child's body thus becomes central in his conscious life, and this the more as in the experience of this one object visual, tactual, kinesthetic and organic sensations flow together in abundance.

If this is the first stage, the second may be marked by the *consciousness of identity* in successive periods. The individual knows himself as the same in every new experience. We have to exclude any purposive meaning of this selfidentity. In the sphere of causal psychology it is simply a question of memory. The child awakes in the morning and knows that he is the same boy he was the night before, because he remembers all of yesterday's experiences. This ability to reproduce our earlier experiences, and to make use of the earlier acquired knowledge, links our whole life subjectively. Only through our memory does our selfconsciousness become complete.

Yet from here it can develop to its still higher stages, which are reached by reflection. The individual reacts toward the outer world which is common to all, but the selection of the outer world toward which he may react depends upon his personality. He sees objects from his window, and other people from their standpoint see what he did not see. The perception of the thing is, accordingly, dependent upon the bodily personality. This leads finally to the theory that all these *perceived and remembered objects are somehow in the bodily personality itself*, besides being outside in the world of space and time. Then they are grouped together with the feelings and emotions and volitions in man and form the content of consciousness which selfobservation and ultimately scientific psychology may analyze. Selfconsciousness at this stage has reached a view according to which each one of us knows a world of objects, stars and chairs and the rest of the universe, and among these objects, we find our-

selves, our bodily personality, and in this bodily personality we find once more the chairs and the stars as our contents of consciousness, dependent upon our body, in particular upon our brain.

From here the idea of the personality can still be differentiated in many directions. As soon as this content of consciousness is considered as something existing in the body, it can be *contrasted with the body* and can be treated as the only real part of the personality. The body is then outside of the personality; the mind is the man, and the body belongs to external nature. We do not lose a part of our personality when our hair is cut or a tooth is extracted, nor even when arms or legs are amputated. But if the mind is the real personality a further elimination is unavoidable. We do not lose a part of our personality when the Latin vocabulary which we learned is forgotten and lost to our mind. Nor do any chance memory contents make up our personal self. We find our true self in the *central functions* of the mind, in its attention and will. The abstractions of the thinker lead from here to speculative constructions, and all these products of subtle reflection are paralleled by the vague ideas concerning the self in the cruder thoughts of the masses.

But at the same time we demand an enlargement of the personality idea. The body is that central agency which acts and which cannot be affected without a feeling of response. But if that is the essential aspect, the personality is not inclosed by the epidermis. All our social attachments, our name and our clothes, our house and in a certain sense our relations to our family and our friends, belong to us in this enlarged sense. Our influence acts for the realization of our wishes like our hands and lips. Our personality is the *individual with his whole social setting* in his vocation, in his country, and this enlarged idea of personality in no way interferes with that concentrated one in which man is only his will.

All these concentric circles, all these wider or narrower groups of conscious experiences which we call our personality, are found in our consciousness. We find there the impressions from our body, we find there the feelings, the volitions, the memories, the ideas of social relations, in short everything which constitutes that empirical personality. The question remains only: who is the one who finds them? Who is the spectator who watches this unified person? Is he himself a personality? But we practically answered this question when we decided at the threshold of causal psychology to treat mental states as describable, that is, as objects. An object cannot be known without a subject which becomes aware of it. The psychologist who demands an objective treatment of inner life must therefore consider all the mental experiences as contents of mind, and must contrast them with the subject which becomes conscious of these contents. This subject is the consciousness. But it would be an entirely unjustified and improper personification, if we were to give any personality character to this subject.

It is not a discovery, but a necessary postulate of the causal psychologist, that every variation in the mental life be a variation in the objects of awareness, not in the subject. All our discussions have been controlled by this postulate without which causal psychology would be impossible. Accordingly the subject cannot perform any action. Its only function is to be aware, that is, to be conscious. This detaching of the function of awareness from the objects of which the subject becomes aware does not set up a real independent individual. Consciousness is ultimately in these constructions of the scientist nothing but a logically necessary point of reference. The mental objects have no existence, if they are not conceived as objects for some subject, and therefore the fact that they are conscious objects is simply expressed in another form, if we say that they are objects given to a consciousness. The subject, the consciousness, cannot influence these contents and cannot do anything with reference to them; it is only passively aware of them. The so-called self-

consciousness is therefore not an act by which consciousness knows itself. If consciousness, as subject of awareness, is the knower, the self which is known by it is something entirely different; it is that central, unified content of consciousness which is influenced by the world and reacts on the world.

The Variations of the Personality.—Every change of the personality must then be a change in the contents of consciousness and in the brain paths, but not in the subject which is conscious of these contents. This content is indeed varying with every new experience which becomes a new incentive for action or a new motive for inhibition, new material for knowledge or new ability. The personality develops steadily. On the other hand, by lack of training or by old age or by diseases it may decay. Certain fundamental traits, however, the type of reaction, the tendencies to feelings, the trained attention, the rhythm of response, the energy of inner activity, may remain the same through all changing influences of the surroundings. The temperament, the character, the intelligence of the personality may last through any change of life conditions. Moreover, the principle which led us to the action theory holds here too. There is no influence of the outer world which is not dependent upon the dispositions for reaction. An individual of a particular temperament and character and intelligence and talent does not stand in an independent outer world which shapes him, but the outer world which has a chance to influence him is itself the product of his tendencies to reaction. Personality and the world are in a complete mutual relation. It is a closed circle. *Each man lives in the world which his inner dispositions select and shape.* The same surroundings are different for every personality.

We are not only changing by new acquisition or loss, but, to a certain degree, each of us is a different personality in different situations. If the essential feature of our personality lies in the system of our memories, we

cannot deny that we are many persons in the same body. We feel ourselves as slightly different personalities when we are in the midst of our family or when we are at work in our vocation, when we are traveling in foreign lands or when we are living in our home garden, when we are at a political rally or at a thrilling theater performance, at a solemn function or in a gay company. Different associations and impulses characterize everyone of such situations. The memories which filled the one are entirely inhibited in the other. To be sure, we are able at any moment voluntarily to awake the memory of the other situation. We can think of ourselves as professional workers while we are thrilled by a drama on the stage, and in the midst of our office work we can think of ourselves as the same who traveled in the world. But this continuity of selfconsciousness is then indeed a mere function of memory.

If by some brain disturbance this memory function has become defective, the bridges from one such personality experience to another may be broken. The individual is now one personality, and the next day another, and on the third day he may have a full memory of the first but not of the second, and on the fourth day a memory of the second but not of the first and third day. The patient may build up through such associative memory connections two very different personalities and even three personalities may live and ignore one another in the same organism. Such cases of *multiple personality* have not seldom been observed. They show a real splitting of the psychophysical system. They are of deep interest for the theoretical study of personality. Only we must exclude the misleading popular view that such a double personality is composed of the normal self and a subconscious self which is ordinarily repressed but which comes to the foreground under abnormal conditions.

Yet in outlining the motives which lead to the development of selfconsciousness, we have not yet spoken of one

which is essential. The idea of ourselves does not develop without the consciousness of other personalities. The infant discriminates between the persons and the things. The mere things hardly change and can be used, and do not start anything, while the parents and the nurse are active and surprising. The child's idea of personality begins as much with the watching of other individuals as with the feeling of his own self. It indicates that we move in abstractions as long as we disregard the individual's relation to other individuals. As soon as we consider them we have stepped over the threshold of social psychology. It was artificial to look on the elementary psychophysical processes as if they occurred in isolation. We had to proceed from them to the complex mental states which the individual finds in his selfobservation. We saw then that it was no less unnatural to treat them as independent mental states. We recognized that they are all combined in the unity of the personality. But now we must acknowledge that it is, after all, no less artificial to consider the individual personality as such an independent mental structure. We never know it in such isolation. The individual is himself an element of the social group and social organization, dependent upon his relations to other individuals.

PART III. THE SOCIAL GROUP

A. ELEMENTARY GROUP PROCESSES

CHAPTER XVI

INDIVIDUAL DIFFERENCES

The Aim of Social Psychology.—If the psychologist tries to describe and to explain all the mental phenomena he cannot disregard those which result from the coöperation of several individuals. The social group may be as small as a family or as large as the concert of civilized nations. It may be as fugitive as the chance meeting of two strangers one of whom asks a question and the other replies, or as stable as a life partnership in marriage. It may be held together by social or professional, economic or political interests. It may embrace people in the same room who see and hear one another; it may be formed by individuals scattered over the world, who know one another by work or reputation. It may be an involuntary relationship like that of the members of a crowd in a panic, or a definitely regulated combination on the basis of statutes and contracts, programs and platforms.

Whatever the form of the social group may be, new mental functions arise from the mutual influence of its members. We have no phenomenon of social psychology before us, if two or a million persons are performing the same act, perhaps perceiving the moon, without being influenced by one another. The interest of the social psychologist begins only where they enter into actual relations: the individual experiences mental states which would

not enter his consciousness without the existence of other men. The simplest gesture or imitation as well as the most complex act controlled by custom or fashion or by law, involves such consciousness of the social group. The psychologist must trace both the mental contents which result and the psychophysical processes which lead to them. Every process in society in which the minds of several individuals coöperate thus becomes proper material for psychological analysis.

On the surface these psychological efforts seem to coincide with those of the sociologists. The science of sociology can be interpreted in many ways, and the differences of definitions point to a real variety of tasks. Some students of sociology consider it their goal to describe and to explain every life function of society. Others claim that this would make all the social sciences, including economics and politics and history only parts of sociology. They want to concentrate the interest of the sociologists on the particular question of how society is formed and how this combination and coöperation of men have developed. But whatever the wider or narrower view of the sociological problems may be, they are characteristically different from the interest of the social psychologist. *For the sociologist the starting point is the group itself.* Its structure, its life, its achievement, are studied, and the mental functions which enter are only means for the explanation of the group development. *For the social psychologist these mental functions are the real objects.* He cannot start, therefore, from the group as such, but must always begin with the individuals. The state or the family, the party or the crowd, the club or the race, has no selfobserving consciousness of its own. The psychological experience of the group goes on in the individual members who stand in contact with one another. Social psychology is therefore the greatest help for sociology, but it remains an independent science.

On the other hand, the social psychologist who starts from the processes in the individual personalities must finally advance from these members of society to their unified organization. He has a full right from his psychological standpoint also to speak of the mind of the nation or of the mob or of the family. He does not refer by that to a mystical higher personality which exists somewhere above the individuals. He forms such a conception in analogy with the coöperation of the cells in the brain. Millions of neurons coöperate in every brain. Each such neuron has its centripetal, its central and its centrifugal part, and each may have its elementary psychical accompaniment. Any number of them may work together in a group, and all together form the personality. In this way every person has its centripetal, its central and its centrifugal part, and its functioning is accompanied by mental states, and any number of such persons may coöperate, too, in groups, and their totality forms the life of mankind. The whole psychophysical brain is as real as each of its cells: in this sense we may say that the whole social group is as real a psychophysical unit as any individual person.

The study of social psychology shows so far a tendency through which its sphere becomes narrower than seems justified. Too often the idea prevails that the interest of the social psychologist properly lies only where the individuals are parts of a general mass, but that it is out of place where single personalities are in the foreground and dominant. The processes of language, of customs, of faiths, in short all which the undifferentiated group produces, are inclosed in the circle, while the productions into which individual statesmen or scientists or artists or religious leaders enter with their personal originality are excluded from the analysis of social psychology. The chief illustrations are therefore taken from the life of the primitive peoples, because the social consciousness of the savages

seems less differentiated, while the highly civilized life is clearly guided by masterful individuals. But that is just as narrow as if we were to omit in individual psychology those states in which a particular idea or feeling or decision becomes prominent in consciousness. We know that in the individual mind the attention usually focuses on one mental content, but this remains nevertheless in complete interplay with all the other elements of the mind. In the social consciousness of the group, too, the attention may be focused on a particular part; on the intellectual or artistic or religious or political or industrial leader. But the mutual influence between him and his followers or his opponents lies entirely within the compass of social psychology. The highest development of the civilized nations is material for psychology as much as the vague, unshaded existence of the primitive races.

Childhood and Maturity.—Where individual psychology ends social psychology has to begin. [The personality is the highest unit which is reached in the former: a combination of at least two personalities is the smallest unit which can be object for the latter.] But before we may ask how personalities can influence one another and work together and experience mental states which they could not have by themselves, we must evidently consider how far the individuals differ from one another. No relation between men can be fully characterized, if we disregard the personal variations. When we studied the elementary processes in individual psychology, we began with the stimulations, because they furnish us the elements, the sensations. Only after knowing these manifold sensations could we proceed to the further elementary process, to the association. Before we ask how individuals associate, we must know, too, how they differ from one another. No two individuals are alike. If men were mentally alike, the social groups would have an entirely different character.

Here we have to enumerate, of course, only those dif-

ferences which have significance for the social organization and the resulting social mental states. We may classify them in four groups. The individuals who form the social world differ, first of all, in *age*. The age variations evidently form a class of their own on account of their necessarily passing character. The group which children and parents or pupils and teachers form is perfectly controlled by the mental characteristics of youth in contrast to the elders. The second class may embrace all the *differences which are common to whole groups of individuals*, for instance to all women as against men, or to all members of a race, or to all individuals of a special nation, to all members of a profession or of a vocation. The third class contains the *individual differences in the narrower sense of the word*, that is, the differences in which we cannot recognize the traits of a large group such as sex or race, but in which the individual really differs from his neighbor. Here belong the variations of temperament, of character, of intelligence, of talent and so on. Finally we may class together those individual *variations which interfere with the normal harmony* of mental life, the pathological mental states.

We have sometimes before had occasion to point to the *mental life of the child*. Every single psychical function which we analyzed in man can be traced backward to a definite period in the child's development, where it slowly began to be formed. Selfconsciousness and will and emotion and ideas and attention are not born with the infant, but slowly secured. Yet we have seen that the newborn child does start with a wonderful equipment of nerve connections which produce important, useful reactions in response to the stimulation of the outer world. This reaction apparatus is in no way perfected by nature in the first days of life. New anatomical brain paths grow and become efficient during the child's development, but the reactions are from the start adjusted to the simple

needs of the infant, and everything which follows is only growth and differentiation.

Even the senses which are open to stimuli furnish at first scanty material. The child does not see colors during his first year; the optical impressions are only shades of gray and movements. The most significant difference, however, is not the meagerness of sensation material, but the lack of connection. Every impression stands by itself on the background of vague organic sensations and feelings. It is one blurring content of consciousness without any inner organization. Slowly memory images begin to arise, and emotions shade the behavior. With the third year not only the memories but general ideas and complex affections are acquired. The learning of the language hastens the intellectual development; the indefatigable method of trying and trying again trains all the psychomotor powers, and they in turn influence the intellectual differentiation and the emotional state.

The compass of experiences is still small, the judgment untrained, but the child of five years has gained all the mental traits of the adult. Yet every function needs its further development. The voluntary attention is still very easily exhausted and lacks all perseverance; the memory is still untrained and highly deceptive; the power of inhibition very undeveloped; the time sense and the number sense clumsy and crude; the apperception controlled by superficial analogies. But every day brings progress, first of all through the child's own efforts, through his exploring in the world and assimilating from the world mentally that upon which he is ready to react. The stream of knowledge becomes broader and broader; the motor training becomes more differentiated; the intellectual abilities become serviceable to tasks of increasing difficulty; and with the power of reading the mental surrounding is endlessly enlarged.

Yet the years of later childhood, of youth and adoles-

cence are not merely an unfolding in which every function becomes more efficient; they are at the same time a development with marked rhythms and with changes characteristic of definite periods, changes which may involve a decrease in the activity of certain mental functions as well as an increase in that of others. The play of the imagination is most vivid in childhood, as it is less checked by an objective memory. The impulsiveness of the child becomes repressed by the sober purposiveness of the adolescent; the quickly growing interest in social relations must inhibit many a fully developed childish interest. The predominant feature of the period of puberty is the rich development of high-pitched feelings and sentiments, often with quick changes and deep influences on the whole intellectual and active life.

The time from the twentieth to the sixtieth year is the period in which the energies reach their full differentiation. The first half of this period may be characterized by the greatest elasticity which the individual can attain; the second half by the greatest maturity of judgment. But while the intellectual powers may continue to increase with experience, the feelings become duller, the motor impulses less energetic and the mental traits of old age begin to creep into the psychophysical behavior. The associative mechanism weakens, the spontaneity of the mind decreases, the senses suffer, the memory for recent impressions becomes defective, the mental life decays. The rhythm of this life history differs greatly with different individuals. Precocious children race through the stages of childhood; many vigorous men reach fourscore years without marked symptoms of decay. But these differences of individual rhythm belong together with those of talent or temperament. Here we have to deal with the average structure which allows a rather precise mental picture of the infant of two, or of the child of eight, or of the adolescent of sixteen, or of the old man of eighty.

Sex and Race.—If we are to trace the characteristic mental features of an individual, we may be greatly aided by knowing to which human groups he belongs. Without analyzing his mental physiognomy we popularly take it for granted that an Italian has different mental tendencies and dispositions from an Esquimaux, a fisherman from a scholar, a jockey from a minister. In short, the mere fact that a man belongs to an objective group, to a race, to a people, to a vocation, seems to allow the assumption that certain mental qualities are to be expected. In scientific thinking we have before us the problem of *group psychology*. Its specific question is how far certain traits are common to all members of an objective group. How far have all the Chinese something in common which makes them different from all the Japanese? How far have all the working men in factories, or all soldiers, or all mountain dwellers, common mental features? It is evident that the groups which are analyzed in such a survey by no means embrace only individuals who are in actual contact with one another, or who have any mutual influence. The mountain dwellers of the whole globe are without connections; those of South America do not come in contact with those of Asia. They form, accordingly, no social group in the sense of social psychology, but they do form a group in the sense of group psychology, as we can ask whether there is anything common to all of them. In the same way we may treat all epileptics or all violinists or all chess players or all people with brown eyes as groups whose common features may be studied. Wherever we have an objective trait which allows a definite grouping, it may be worth while to examine whether certain mental features are correlated with it.

Of course such a correlation will hardly ever be complete. We may find that one race is phlegmatic and another vivacious, but that certainly does not exclude their sometimes exchanging rôles. If we have a large number

of individuals, the average characteristic may be relied on. A whole crowd of Russians will behave differently from a crowd of Spaniards or from a crowd of Englishmen, but the individual Englishman may show traits which we are accustomed to expect from a Spaniard or a Russian. A man of affairs may have the artistic temperament of a musician, and a musician may have the practical mental trend of a captain of industry. There are men who have a female trend of mind, and women with strikingly male mental features. That an individual belongs to a certain group, therefore, does not mean that he is invested with all the average features of the group. But this does not negate the value of psychological group analysis.

The two largest groups which may be contrasted are those of *male* and of *female* individuals. Careful experiments have thrown light on the differences of memory, attention, feeling and other mental functions in boys and girls and in mature men and women. Such experimental results can easily be supplemented by social, statistical material, by historical reports and the account of male and female achievements in civilization. The psychologist certainly cannot point to any one mental function which is present in all men and absent in all women, or vice versa. It cannot even be said that either sex possesses a characteristic trait in which some members of the other sex may not excel too. Yet such studies leave no doubt that significant differences exist. It would be superficial to claim that the mind of man or of woman is superior, but each has its peculiar points of strength and weakness. The survey of a large field shows first of all that men vary more strongly. Women are nearer to the average type. The extreme variations above and below the average occur more frequently with men. They show the greatest development of intellectual, emotional and volitional powers in the case of scientific or artistic or political or religious genius and the greatest criminal depravity. The average

female mind is patient, loyal, reliable, economic, skillful, full of sympathy and full of imagination; on the other hand it is capricious, oversuggestible, often inclined to exaggeration, disinclined to abstract thought, unfit for mathematical reasoning, impulsive, overemotional. The good and bad features alike can be understood as the results of a more emotional temperament in women than in men, and secondarily as the results of greater activity. But the chief point is that in men the various contents of consciousness remain separate, while in the mind of women they fuse. Her life, therefore, has more inner unity, and she shows more readiness to devote all mental energies to one idea. But for the same reason she must be influenced by prejudices, must show a lack of logical discrimination, must be under the control of the present impressions and too little directed by the arguments which reason and memory supply.

The mental traits of the different *races* and *peoples* are much discussed in ethnological studies, but have as yet been very little examined by the methods of scientific psychology. Those mental functions which can most easily be submitted to experimental investigation, the elementary functions of perception, attention, memory, and feeling show rather insignificant differences. The visual sensations or the reaction times or the memory span are the same for an American and a German and a Russian. The real variations appear only in the more complex functions which are less accessible to mass experiments. Hence the material of ethnological psychology still lacks experimental exactitude. It is taken partly from a general observation of the peoples and their life and partly from a psychological interpretation of their objective achievements in the world of civilization. The manifoldness of traits becomes truly psychological material as soon as the particular forms of behavior and of achievement are recognized as the expressions of simple mental functions.

It has been pointed out, for instance, that in Europe there must be a fundamental racial difference between the Greco-Latins and the Teutons. The Greeks, Romans, Italians, Spaniards, are talkative, quick and vivacious in their actions, while the Germans, English, Dutch, Scandinavians, are taciturn and deliberative. The Greek temples are simple; the northern cathedrals complex. In music the Latin nations love the single melody in its clearness and simplicity; the Teutonic nations the complexity of counterpoint: in literature the unity of action in Greek or classic French drama contrasts with the complexity and wealth of Shakespeare or Goethe: in painting the simplicity of Italian art is strikingly different from the manifoldness of the Dutch. But the same contrast appears in the intellectual and emotional, in the political and practical life. The southern peoples are children of the moment: the Teutonic live in the things which lie beyond the world, in the infinite and the ineffable. Even in the popular games the Greeks confined themselves to the simple contests like running and jumping and throwing the discus, while the Teutons prefer the complicated cricket and football. In short, the Greco-Latin civilization tends toward clearness and simplicity; the Teutonic toward complexity which is based either on a greater number of factors or on a greater irregularity in their combination. If it is brought to its ultimate psychological expression, the Greco-Latin is absorbed by what the perception offers, and his attention inhibits the onrushing associations; the Teutonic mind divides its attention and always has room for suggested side issues. A social group into which a large number of Italians or Frenchmen enter must therefore have mental features sharply different from those of a social combination in which Englishmen or Germans prevail.

Much psychological attention has been devoted to the *primitive races*, and recent ethnological expeditions have

not seldom been accompanied by psychologists who carried their reaction time instruments and attention apparatus to the South Sea Islands. Yet the results indicate a very thorough similarity of all human beings, as far as the most elementary functions are concerned. The popular idea, for instance, that the senses of the savages are sharper than those of civilized men can be disproved by exact experiment. If certain tribes are able to recognize objects at distances at which civilized men do not notice anything, it is essentially through training of the attention for the observation of small signs, a training which is forced on them by the conditions of their life. The true mental differences between the primitive and the civilized peoples appear in the more complex functions. Sociologists are inclined to insist that the power of attention in primitive man, the power of inhibiting impulses and the power of original thought are weaker than in the higher races. But these impressions are too often gained by studying the mind's work through tests which do not belong to the natural course of primitive life. If the standpoint of the primitive man himself is really taken, these mental powers, in particular the power of inhibiting impulses, frequently seem remarkable.

Character and Temperament.—As soon as we turn to groups of *vocational* character, the situation shows new features. In our highly differentiated social life the mental traits of different professional groups seem even more distinct than those of different racial elements. In America a hundred lawyers, a hundred actors, a hundred school teachers, a hundred storekeepers and a hundred ministers would show in the group average stronger difference of mental behavior than the average of equally large groups of Anglo-Americans, Swedish-Americans, German-Americans and Scotch-Americans. But those racial groups are formed by birth, the vocational groups by free selection, and this selection is evidently itself a mental process. If we ask

for the mental traits of the actors as against the ministers, we contrast two groups which are originally characterized not by the external performance on the stage and in the pulpit, but by the internal desire for theatrical life or for church life. These desires are mental functions and the real problem is then: what are the other mental traits which usually accompany these desires? The problem of group psychology is then replaced by the other problem: how far do various mental traits hang together? But if we raise this question, we must ask first how far mental traits vary from individual to individual.

We must now consider the most prolific source of individual differences, *the personality* as the product of its inherited dispositions. In any group, in any race or community or vocation, we find psychical differences from person to person, just as in spite of racial anthropological traits even in the same city no two faces look exactly alike. Individuals may vary in their emotional dispositions or in their tendencies to action or in their ability for mental readjustment or in their fitness for particular achievements: the differences of temperament, of character, of intelligence and of talent. But these marked variations to which we are accustomed to give our chief attention in practical life are surrounded by innumerable differences of perception, memory, imagination, attention, feeling and volition. We frequently had to point to such different shadings before. We spoke of the visual, acoustical and kinesthetic type of reproduction and of similar mental variations.

The individual traits are to a certain degree the results of life history. They have developed through the experiences in childhood, through the training of abilities, through the acquiring of associative material, through the awaking of desires and interests in the formative period of the mind. But no training and no external influence can entirely supersede the inborn tendencies. They are

the product of *inheritance*. (Not only unusual talents like the musical or mathematical or linguistic powers can be traced through family histories, but the subtlest shades of temperament, character and intelligence can often be recognized as an ancestral gift.) Statistical studies which covered many characteristic opposites like industrious and lazy, emotional and cool, resolute and undecided, gay and depressed, fickle and constant, cautious and reckless, brilliant and stupid, independent and imitative, loquacious and silent, greedy and lavish, egoistic and altruistic, and so on, have indicated clearly the influence of inheritance on every such mental trait. The inheritance from father to son and from mother to daughter is thirty to forty per cent. more frequent than the crossed inheritance from father to daughter or from mother to son. But the influence of the mother on the mental traits of the children is about ten per cent. stronger than that from the father. The probability that intellectual qualities will be inherited in the second generation is greatest, next the moral qualities and after them those of temperament.

The varieties of *temperament* have always been noticed. The old division into the melancholic, phlegmatic, choleric and sanguine persons drew its names from a long forgotten medical theory, but it refers to types of emotional life which can still be contrasted to-day. The sanguine and the phlegmatic are inclined to superficial emotions and their superficiality makes both somewhat optimistic, but while the sanguine person experiences the emotions in quick rhythm, the phlegmatic passes slowly through the changes of feeling. The choleric and the melancholic are subject to strong emotions, on the whole, with a pessimistic tendency, but with the difference that the choleric has the quick, vivid, almost stormy emotions, the melancholic the slow, lasting excitements and depressions. But while these four groups of dispositions only are usually called temperaments, we can easily discriminate other lasting ten-

dencies in affective life. The contrast of frivolous and of morose, of courageous and of timid, of passionate and of apathetic dispositions do not coincide exactly with any temperament.

\ The disposition to will action, the *character*, varies especially in its strength. The power to keep the selected motive dominant can grow to a heroic force against which no fear and no temptation can prevail to change the psychomotor setting, and it can sink down to the attitude of the weakling whose will decisions are outbalanced by any new chance proposition or by any passing fancy. But the powerful character can serve egoistic as well as altruistic ends; thus the mere strength is no pledge of morality. The morality, the frankness, the loyalty, the reliability of character and their opposites are hardly elementary dispositions, but combinations of will and emotion.

Still richer are the differences of *imagination*, even if we abstract from those varieties of sensorial reproduction which make one man's imagination work in pictures and another's in tones, one in words and one in movements. The fundamental differences of imagination lie in the power to organize the associative material under the control of subjective feelings and wishes. This difference between poor and rich imagination may be divided further by the individual tendency to yield passively to the play of ideas or to control them actively in the service of a plan, however much this plan may be condensed in the mind into a mere emotional excitement. The artistic imagination is of this active type.

Intelligence.—By *intelligence* we meant the ability to adjust the mental setting to a new situation. No teacher who knows the class has any difficulty in grading the pupils according to their intelligence. Such ranking would not correspond to the total intellectual achievement of the pupils, as the intelligent one may be lazy and careless and the rather stupid may overcome his defect in the

school class by industry and effort. The intelligent may even be hampered by a poor memory and the less intelligent helped by an excellent memory, and yet independent of these secondary aids to intellectual work the poor intelligence remains easily recognizable. No one's intelligence can serve equally well in all departments of intellectual culture. Disposition and training makes one more able to show his intelligence in pure reasoning and quick adjustment to abstract judgments, while another may prove it in rapid adaptation to complex practical conditions. One may more quickly turn to superordinated ideas and another to subordinated ones, one may be more inventive, another more speculative.

In the psychological laboratories methods have been developed not only to study all such variations by long research, but to determine them quickly by *standardized test experiments*. It is not difficult to find out the quality of an individual's memory for numbers or words or colors or faces or tones or whether his attention has a wide or a narrow span, whether it is steady or fluctuating, whether the associations are controlled more by recency or by frequency or by vividness, whether they are slow or quick, whether they are chiefly coördinated or subordinated, and so on without end. But from such simple tests the analysis may proceed to more complex experimental questions by which the temperament, to a certain degree the character, the tendency to emotion, and above all the variations of intelligence can be traced. The experiment creates miniature situations in which the individual has to perform his act and this can be compared with average achievements under the same conditions.

We may test the intelligence by measuring the time needed to recognize certain wrong conclusions as illogical, or to fill out certain blanks in a sentence, or to make a sentence out of certain given words or a word out of given letters or to solve an elementary technical problem such as

the opening of a box with a complex system of fastenings. This study of mental tests, which has almost grown into a science by itself, plays its most significant rôle in the service of practical achievement. Such tests are needed to determine for what function in life a man is best equipped, or how far the testimony of a witness in court is reliable, or what defects of mental life can be found in a patient, or what degree of intelligence can be accredited to a pupil. In short, the problem of tests is so firmly connected with the work of applied psychology that it had better be left for our psychotechnical part.

The test experiment leads also to the difficult question of how far variations in different mental functions are *correlated*. Is it true that a particular kind of memory goes with a particular kind of attention? Does strong character coincide with high intelligence? Is a rich imagination connected with a special temperament? Is it true that mathematical and musical talent occur together? Does a good memory for figures accompany a good memory for forms? Practical life gives plenty of hints in such correlation problems, and the proficiency of the pupils in school in the various fields of knowledge offer rich material for such comparative studies. But the chief supply of data must come again from the experiment. We may test the memory of a hundred men by measuring the number of seconds necessary to learn certain figures or words; the rapidity of reaction by measuring in thousandths of a second the response to an optical stimulus; the power of discrimination by measuring the just perceivable differences of pitch, of color and of weight; the attention by measuring the number of *e*'s and *r*'s which can be crossed out on a printed page in five minutes; and so on. For each of these tests we may rank our hundred subjects according to their achievement, and then study how far the order corresponds. With exact formulæ we can deduce

from such results how far proficiency in one task corresponds to proficiency in another.

But here too the practical interest prevails. We want to foresee through the study of such correlations what we may expect from an individual who shows a particular trait. In the interest of practical purposes we want to predict whether he possesses certain other traits too. The central theoretical fact is, that such a correlation does not exist between mental functions which have no common element or no common cause. The degree of correlation simply indicates the relation between those conditions which the two functions have in common and those which they have not in common. This whole science of correlation throws a new interesting light on the inexhaustible manifoldness of human individuality and emphasizes anew how different the individuals are who enter into the social groups.

Abnormal Variations.—The individual differences of man are not completely characterized, unless the variations are also considered by which the mental equilibrium is disturbed: the abnormal variations. We have repeatedly had to discuss the changes which disease may bring; we traced the losses of memory or the splitting of the personality and so on. One thing showed itself at every point: the mental disease does not introduce psychological elements or functions which are different from those of normal life. Every pathological variation consists of the same psychophysical processes which we know from ordinary behavior. What is changed is only *the proportion of the processes*. Their harmony is disturbed; we compared it with a caricature in which the normal relation of the features is distorted. The cartoon shows too much or too little of some bodily trait. In the distorted mental physiognomy there may be too much or too little of an emotion or of a volition or of an idea or of attention, too strong or too weak reactions or associations or inhibitions.

This comparative interest in the pathological trait as a mere extreme variation of the normal is indeed essential for the theoretical psychologist, in contrast to the interests of the physician, who must look on those mental disturbances as symptoms of definite diseases. If we approach in applied psychology the problems of psychotherapy, this interest of the physician must be decisive. But here in the field of theoretical psychology we are not concerned with symptoms of diseases. We have only mental variations any one of which may enter into many diseases, just as fever may be a symptom of many bodily disturbances. Above all, each of these pathological variations appears to the psychologist in a continuous series which leads from the normal to the pathological without any sharp demarcation line.

The extreme depression of the melancholic patient is then only an abnormally strong increase of a normal sadness, and the gaiety of the maniac an exaggeration of a normal hilarity. We know less intense fluctuations in the compass of normal life; we know pessimists who are easily depressed, and silly persons who are often hilarious without reason. It is the same variation, but we call it normal, as long as the personality still retains its equilibrium: we call it abnormal, as soon as this balance of the mental functions becomes so disturbed by the exaggeration of the emotion that the ordinary life purposes cannot be fulfilled. The maniac who is so excited that he gives no attention to the outer world or the melancholic patient who in his brooding declines to eat, cannot survive in the struggle for existence. If the mental mechanism as a whole secures a checking of a too strong or a substitution for a too weak development, the personality may be unusual, eccentric, or somehow deficient, but not pathological. The philosopher may doubt the reality of the outer world, but his doubt is completely organized in his mental setting and in no way interferes with his practical attitudes to

ward the world. He is therefore normal, however much his ideas may differ from those of the average man. But the same doubt as the starting point for behavior which tries to ignore the perception of the outer world is self-destructive and must lead to the doors of the asylum.

We may discriminate *four large groups of mental disturbances* with reference to four classes of psychophysical conditions. Large areas of brain neurons may be destroyed beyond repair and definitely eliminated from cooperation. The degeneration of extensive brain parts in general paresis is typical of such partial death of the psychophysical organ: mental life crumbles. In a second group the brain neurons are temporarily affected. They may be exhausted, poisoned, paralyzed for a period, but can recover; the partial loss of mental functions may be overcome. The cause of this passing injury is an auto-intoxication of the body. The special sources of these self-produced poisons are still little known, but it is certain that the normal working of the brain depends upon the presence of chemical substances in the blood which are supplied by ductless glands. If through a disease of these glands, or through any other disturbance in the metabolism of the body, necessary chemical elements are lacking or are too abundant, the brain passes through longer or shorter attacks of abnormal functioning. The periodic and alternating insanity, the manic depressive attacks, many delusional states, must probably be grouped in this class. As soon as the toxic disturbance is removed, the poisoning substances eliminated, the brain returns to its normal work. Quite similar is the third group in which the poison is introduced from without. Even a simple alcoholic elation is such a poisoning of the brain, which in its extreme form leads to delirium. Morphinism and cocaineism are of the same order.

Quite different from these three groups, and psychologically the most interesting, is the fourth group. It is no

less based on abnormal changes in the physiological mechanism, but the disturbance is not one by which particular neurons are destroyed or temporarily paralyzed. It is essentially one of abnormal connections in the central brain paths. The excitement irradiates into wrong neuron groups; the association process does not stir up the biologically useful centers. Misleading connections are formed. It is as if the wires were crossed, and a torturing disorder may result. This develops especially from emotional shocks, but may arise in any brain which has a disposition to neurasthenic or psychasthenic or hysteric states. The after-excitement of certain neuron groups forces the opening of association and reaction paths by which unfitting ideas, movements and gland activities are produced, and by which negatively the normal associations and reactions are cut off. A general dissociation may arise in this way. Some complex after-effect of an earlier experience may get increasing control of the psychophysical reactions and work as a foreign intrusion in the mind. The resulting phenomena are of bewildering manifoldness, and it is often very difficult to discover the source of the obsessions, the unfounded emotions, the fears and anxieties, the onrushing movements and all the other erratic functions.

It is this group of abnormal psychophysical processes which has most often suggested the interpretation by subconscious mental states. If this psychical terminology is used only in order to have a convenient means of description, there is indeed no objection. It is easier to describe the after-effect of an earlier experience and of an emotional excitement as a subconscious memory with subconscious affections than to characterize the after-process in terms of physiological neuron processes. For the practical purposes of the physician the account of the events as subconscious is almost unavoidable, but on the basis of theoretical psychology, we have no right to surrender the prin-

ciples upon which the possibility of psychology depends. We must translate the story of the subconscious mind into the language of brain physiology.

Destroyed neurons, temporarily paralyzed neurons and wrongly connected neurons are responsible for those extreme variations of mental life in which the individual is partly unfit to enter into the coöperation of the social group. Many gradations between the entirely normal and the strictly pathological are possible; and so we find a dense population in that great borderland region between mental health and illness. The defects of temperament, character and intelligence may show millions of shades, down to the hopeless inefficiency of the imbecile and the idiot whose mind does not grow beyond the development of the child. The stupid, the clumsy, the inattentive, the forgetful, the weak, the morose, the intemperate, the vicious, the cruel, must be dragged down in the struggle for existence by their shortcomings in the intellectual, moral or practical equipment. Yet while their whole life trend may be deeply influenced by such a deficiency, the disastrous effect is the outcome of an elementary variation in the psychophysical system. The association paths do not conduct the excitement easily enough, or the motor settings are not firm enough to resist the opposite impulse, or the inhibitory mechanism is deficient, or the after-effects of previous stimuli too easily fade away, or the connections for coöperation of the brain parts and for irradiation are in poor working order. In every case the simple cause must produce its effect again and again, and the cumulation of the ill-adjusted responses ruins the social development of the personality. No one is born a criminal, but if his psychophysical equipment is inferior, the chances are great that the temptations of life will find him unprepared for the needed resistance.

CHAPTER XVII

UNION

The Conditions of Organization.—When we traced the elementary processes in the individual mind, we naturally began with the simplest contents, the sensations, and then asked how they are connected with one another by association and irradiation and how they suppress one another by inhibition, and how they become organized in complex groups. In studying the social mind we must follow the same course. Now we know the elements: the personalities with the whole manifoldness of their mental differences. Our next problem must be their association and interrelation, their mutual reënforcement and inhibition and their organization in groups. We may class the elementary processes involved under three headings: union, submission and selfassertion. The elements in social groups must first enter into some mutual relation; they must come nearer together and overcome their isolation. All the processes which work toward this end may be classed under the general heading: union.

But the social groups are not simply the aggregates by firmer or looser attraction. The organization of the group depends upon subordination and superordination, as well as mutual approach. In the individual consciousness the attended idea asserts itself, becomes emphasized, and becomes the center of new associations, while the other mental states are inhibited, suppressed and deprived of their vividness: the individuals in the social consciousness may also be dominant or suppressed, may be aggressive or submissive. These inner relations toward other individuals

may take any number of forms and the result is an endless shading of the social groups. If the fundamental tendency of the relation is the selfsuppression of the personality in the interest of others, we may call it submission: the opposite tendency which leads to the suppression of others may be called selfassertion. In each of these three groups, union, submission and selfassertion, we have reactions from person to person which are combined in the complex processes of actual civilization. It was an abstraction when we spoke of any one of the elementary processes in the individual minds as if it existed by itself. In reality they all are intimately intertwined. In the social mind too the processes of union, submission and selfassertion can be separated only by artificial demarcation lines, and even those are by no means rigid. The grouping is only an effort to bring order into these interpersonal relations. Nothing but the barest outlines of the field can be drawn here.

In turning to the social reactions, we are certainly not disloyal to the biological theory which controlled our explanation of the individual functions. If the psychophysical apparatus produces a biologically useful result in approaching the helpful and escaping the injurious parts of outer nature, it certainly serves no less significant interests when it brings man into organization and coöperation with his fellows. The individual secures advantages which he cannot gain in isolation, and in addition to these biological interests of the individual, the interests of the race as such are served by the creation and training of the progeny. Civilization certainly means something very different from a mere biological development of the race, but there is nothing in it which cannot be completely brought under the biological point of view. Historical society finds its deepest interpretation only through purposive psychology, but no element in it is inaccessible to the explanation of social, causal psychology. We may consistently treat the

individual who enters into the social group as a psychophysical mechanism dependent upon biological conditions, and yet explain the most complex processes of social life.

Voluntary and Involuntary Communication.—Our first survey is to select those functions by which the individuals are bound to one another. The starting point is the child's recognition of personalities as different from the lifeless things in the surroundings. We emphasized, when we spoke of the development of the self, that the child builds up the idea of his own personality in steady correlation to the idea of those around him. The I and the you grow up together. The things of the surroundings are moved, while the parents and the nurse move themselves. The things can be handled and do not change, while the persons resist or yield in an active way; and this makes to the infant the greatest difference in his little world. It remains the greatest difference throughout life. Even this mutual influence of the idea of self and of neighbor does not disappear when infancy turns to childhood, to adolescence and to maturity. It only becomes more ample and differentiated. The idea of our self remains a reflection of those with whom we are in contact.

Almost at the threshold of life selfexpression becomes a means of communication. The infant not only cries to discharge his discomfort, but very soon also to call his mother. When the motor reaction of crying brings the adult to the cradle, a means of communication has been established, from which a steady development leads to the oration with which thirty years later the man may appeal to the mass meeting of voters. Yet this first budding intention of the infant to attract others is not the beginning of the mental social contact into which he enters. Before the child becomes aware of the effect of his expressions on others, his movements have been observed by his elders and have been understood by them as symptoms of inner feelings. The rhythm of his breathing, the tensions of

his face, have established a relation from mind to mind.

We must discriminate, accordingly, two starting points for the social process, *the involuntary muscular, vascular and glandular discharge of inner states*, which can be noticed by others and understood as an expression of feelings, and on the other side *the intentional movements* produced for the purpose of drawing the attention of others and communicating to them something of the inner experience. From both beginnings a steady development goes through the individual's life and while the two elements of social behavior are more and more intertwined, they can still be traced as two independent factors on the highest level of maturity. At every stage child and man express involuntarily their feelings and emotions. In crying and laughing, in blushing and growing pale, in trembling and fainting, in movements of attention and disregard, of approach and escape, the inner excitements are shown to the social group. Even where the intention is the opposite, where the criminal tries to hide his guilty emotion, he may betray it by the unintentional expression of his fears.

Largely beyond the control of intention, these expressive movements are preëstablished by the inborn nervous connections; not a few of them may result from a biologically useless overflow of energy or may be only survivals of reactions which were helpful to the race at lower stages of animal development, or to man in more primitive periods. But while they have lost their immediate biological usefulness, they have not lost their significance for social contact. The social group would be deprived of an essential tie, if men were only expressing what they intend to express. Even when the stage of intentional language expression is reached the rhythm and choice of words says more than the speaker plans. Often the strongest sympathies and antipathies are stirred up by the involuntary expressions in speech and action.

Language.—Speech itself develops essentially from the intentional expressions. They may take a manifold form before the movements of lips and vocal cords are added. The finger which points to the desired object secures voluntary social contact. The complex sign language of the deaf mutes indicates how such expressive gestures may become the carriers of communication concerning a rich, mature life. The pointing gestures are supplemented by descriptive movements, and finally by symbolic movements. Among the southern peoples with their more vivid temperament this communication through gestures remains important by the side of the full-fledged language. But it is, after all, the production of the spoken language which binds the human individual most firmly to the social group and allows him to share the civilization of his place and time.

The language of man is preceded in the animal world by the cries and calls, the tones and noises of the amphibians, the birds and the mammals. Their social effects of attracting the mates, of warning and deterring are prominent, although much of the beast's hunger cry or of the bird's song may be only an overflow of the inner affection without social aim. In the child the mere crying is from the middle of the second month supplemented by meaningless articulated sounds, which in the second year of life yield more and more to articulations with definite communicative intentions. The sounds which the expiration, the contraction of the vocal cords and the tongue movements produce, become the signs for objects, based on the child's dawning understanding of words spoken to him and on the imitations, and at first meaningless repetitions of what he hears. The child does not invent words; he simply makes use of the involuntary sound expressions of inner states and proceeds by imitations.

We should no longer be dealing with the elementary functions, if we were to consider the further complex de-

velopment of language in the individual; and we should remove the discussion into the field of historical psychology, if we were to consider the psychological changes in the languages of the past. Here we need only point to this half involuntary, half voluntary system of reactions by which the psychophysical individuals are linked together. The production of sounds in the speaker corresponds to the understanding in the hearer. This understanding of the meaning is a process of association with which we are familiar from the analysis of the individual mind. We recognized that its chief part consists not in the awaking of conscious memory images, but in the setting of the physiological interconnections. By this the sound of the word opens certain channels of discharge and closes others, facilitates the irradiation of excitement to certain associations and inhibits other antagonists; in short, creates a setting by which the further psychophysical process is determined.

The substitution of visible signs in written or printed form does not alter the fundamental character of the relation between mind and mind. It is a problem of individual psychology to trace the steps by which we learn to connect visible signs with the spoken word and to link the meaning directly with the perception of the written or printed letters, or by which we acquire the ability to write under the immediate impulse of the idea of meaning. But the problem of social psychology, the intercommunication of minds by linking ideas with signs which can be perceived and understood is not changed through the substitution of writing or printing for mere speaking. On the other hand, the social group itself is by this process enlarged in space and time. Only the visible word can bind individuals separated by centuries and divided by oceans.

Associations.—Gestures and speech create the formal conditions for the social connection, but other desires and impulses must draw men together. The mere ability to un-

derstand one another does not involve the desire to form a group. Yet this longing for firmer contact is a deep-rooted instinct in every human mind. Man shares this gregarious desire with the higher animals. (In its higher forms it finds a background in a *consciousness of kinship* which involves elements of thought, but instinctive behavior in the higher animals makes them also seek the contact only with members of the same species. The desire for solitude is the artificial product of a refined society, a reaction against the animal impulse of the masses. Isolation is punishment not only because of the resulting ineffectiveness but through the lack of satisfaction of the craving for social contact.) The complex technic of interchange emancipates civilized individuals from the herd-like personal contact. It secures the same satisfaction by an intellectual and emotional association of men with the help of the written or the printed word, the scientific or the artistic production, the social or the political achievement.

This clannishness which makes man long for men is concentrated in the individualized desires for friends and reaches its highest tension in the focused love between man and woman. *Friendship* demands a more complete mutual understanding and agreement than the chance relation between any members of the tribe, while *love*, of course, intensifies the social instinct by the entirely different element of the sexual desire. Yet this, too, is a craving for contact in which the strongest imaginable union of the personalities is passionately sought. The sensation of bodily contact directly felt or longingly anticipated becomes the center of consciousness, controls the complete psychophysical setting, secures by its emotional resounding the dilation of blood-vessels and the activity of glands, and forces mind and body toward the contact with the loved individual. The immediate wish for contact between men may thus vary from the most superficial preference

for a mere being together with some one to a lifelong loyalty and an overwhelming desire for one individual. Loose and firm, large and small social groups must arise from this emotional, mutual attraction.

(But all these emotional and instinctive desires for social contact must be supported by the results of intellectual insight into the practical needs. The individual recognizes that he can protect himself best by combining with others. / The aim may be defense or attack against common enemies, or the provision of food or clothes or shelter: at every stage the practical achievement is dependent upon the *cumulation and division of labor*. From the primitive hut life to the modern factory, technic demands many minds working to one end; and the masses of the party or of the army or of the whole nation require a conscious coöperation, firmer than any mere desire could secure. But it is not work alone which makes comrades: play succeeds in it no less. The *desire for play* is in itself not necessarily social. The child may play indefatigably with some noisy toy. It is nature's scheme to train the individual and to prepare him for the tasks of life by making him exert his psychophysical powers with joy. But the opportunities to make use of his intellect and of his emotions in a playful way cannot be realized more fully than in the game with equals. Hence the playing instinct also helps to attract individuals to one another in social groups, from the play of the nursery to the outdoor game and the dance of adolescence and maturity.

Yet the manifoldness of social groups can never be obtained by a mere firm coördination of the individuals. An organization is needed which involves superordination and subordination. We must ask what mental states lead to this shading of the members of society.

CHAPTER XVIII

SUBMISSION

Suggestion and Selfassertion.—Whatever the psychological form of onesided or mutual approach may be, as soon as contact between individuals has been established, the chances are great that the resulting social group will be shaded by inequality. If one is giving and the other taking, one commanding and the other obeying, one leading and the other following, one teaching and the other learning, one helping and the other leaning on the help, one displaying himself and the other admiring, we have a mutual relation in which both parts are significant. Yet the mental processes on the two sides are so different that we must separate the inner processes of the leaders from those of the followers. We begin with the attitude of subordination. We may consider as such states of submission all attitudes and settings by which the individual limits and narrows his own mental life, his own ideas and feelings and volitions under the influence of other individuals. The submission may be automatic or voluntary.

The central feature of the selfeffacing process is a submission of action. Its clearest form is the yielding to suggestion. Of course, we all know a still more direct surrendering of our own will, namely, the accepting of advice based on logical arguments or on superior knowledge. If I wish to conserve my health, I act not as I personally may like to act, but as my physician advises me, and if I want to take a journey, I choose the train in accordance with the information which I receive. But if we subordinate ourselves knowingly to those better informed, the result

does not depend upon a special social act; it is an ordinary thought process and it is secondary that the motives which control our decision are received from other individuals. But if we come to the accepting of suggestions, this personal relation from man to man becomes essential. It is truly a new characteristic process. Suggestion is often misunderstood, and the frequent popular discussions put the emphasis on wrong points. *Suggestion is always a proposition to action.* The proposed action may be external or internal, a movement or an attitude. A suggestion never refers to a mere idea. If I simply arouse imaginative ideas in another man's mind, I do not suggest anything to him. If I ask a man to imagine a clove carnation and its peculiar smell, my request may be successful in awaking his reproduced sensations, but that has nothing to do with suggestion. We have the other extreme before us, if I hypnotize a man and tell him that the pencil which I hand him is a clove carnation. If he enjoys its fragrance, it is a case of successful suggestion, not because the idea of the flower came up in his mind, but because he took it to be real. This acceptance of the imagined impression as reality is an inner activity, an attitude, an inner deed. Not the idea but the belief in the idea is the product of the suggestion.

Moreover what else is a belief but a preparation for action? I may think of an object without preparing myself for any particular line of behavior. Here in the room I may think of rain or sunshine on the street as a mere idea. But to know that it now rains or shines involves a complete new setting in my present attitude, a setting by which I am prepared to take an umbrella or a straw hat when I leave the house. I may think of the door of this room as locked or unlocked without transcending the mere sphere of imagination, but to believe that it is the one or the other demands again a new setting in my motor adjustment. If it is locked, I know that I cannot leave

the room without using the key. Every belief demands the preparation for a definite line of action and a new motor adjustment in the whole system by which the actions in future will be switched off at once into particular paths: and there is theoretically no difference whether my belief refers to the proposition that the door is open or that a God exists in heaven. But if every belief is such a new motor setting, then the whole question of suggestion is one of motor influence.

Not every proposition to action or to belief can be called a suggestion. A mere request, "Please pass me the book on the table," or a mere communication, "It rains," may produce and will produce the proper motor response, the movement toward handing over the book, or opening the umbrella; and yet there may be no suggestive element involved. We have a right to speak of suggestion *only if resistance is to be broken down*. If I say to the boy, "Hand me the book," when he is anxious to hide the book from my eyes, and the tone of my request overwhelms his own intention, then, to be sure, suggestion is at work. The stronger the resistance the greater the degree of suggestive power which is needed to overcome the primary motor setting. If I say to a normal man, "It rains," while he sees the blue sky and the dry street, his impression will be stronger than my suggestion. But if he is suggestible, and I tell him that it will rain, he may submit and take an umbrella on his walk, even if no outer indication makes a change of weather probable.

Suggestion is certainly nothing abnormal and exceptional, nothing which leads us away from our ordinary life. There is no human life into which suggestion does not enter in a hundred forms. Family life and education, law and business, public life and politics, art and religion, are dependent upon suggestion. In every field the individual submits to propositions for motor settings or actions which he would not perform, if he were only following

his own impulses or his reason. Daily experience shows us that different men have different degrees of suggestive power. Some men's arguments and propositions leave us indifferent. We understand their thoughts, and yet we remain accessible to opposite influences, while others make us ready to carry out their propositions, even if our first inclinations turn the other way.

But still more important is the different degree of individual suggestibility, that is, of the readiness to accept suggestions. From the most credulous to the stubborn we have every shade of suggestibility, the one impressed by the suggestive power of any proposition which is brought to his mind, the other always inclined to dissent and to look over to the opposite argument. Such a stubborn mind may even develop a negative suggestibility. Whatever it receives awakens an instinctive impulse toward the opposite. Finally we are all suggestible in different degrees at different times and under various conditions. Emotions reënforce our readiness to accept suggestions; hope and fear, love and jealousy give to every proposed idea an abnormal power to overwhelm the opposite idea, which otherwise might have influenced our deliberate action. Fatigue and intoxicants also greatly increase suggestibility.

To point to the extreme form, it may be added that it is only an artificial increase of suggestibility which constitutes the *state of hypnotism*. The hypnotic effect results only from the mental conditions of the subject and not from any special influence emanating from the mind of the hypnotizer or from any especial power flowing from brain to brain. Everything results from the change of equilibrium in the psychomotor processes of the hypnotized, and thus upon the interplay of his own mental functions. All that is needed is a higher degree of suggestibility than is found in normal life. In such a more suggestible state even the direct sense impressions may be overwhelmed by the proposition for an untrue belief, and the strongest desires may yield to the new propositions for action. Whether I say, "You

will not move your arm," or whether I say, "You cannot move your arm," awakening in the one case the impulse to the suppression of the movement, in the other case the belief in the impossibility of the movement, the arm remains stiff. If the subject is in the strongest hypnotic state, I may tell him that our friend has left the room: he will not see him, he will not even hear a word which the friend speaks. The direct sense impression of eye or ear is completely eliminated by the suggestion.

The increased suggestibility is produced by slight visual or tactual stimuli, by monotonous sounds or by words which encourage relaxation and sleep. The subject may stare at a shining button held in front of his forehead. But in any case it is the play of his own imagination which produces the sleep-like state. No one can be hypnotized for the first time against his own will. To expect strong hypnotic effect from a certain individual is often in itself sufficient to produce the sleep. Hence there is no special personal power necessary. Anybody can hypnotize, and almost with the same sweeping statement it may be said anybody, with the exception of young children or insane persons, may be hypnotized. Yet not everybody can be hypnotized to the same degree. The lowest stage of hypnotism is that breakdown of the resistance in which the subject can no longer open his eyes against the order of the hypnotist. Rather few can be brought to the point of accepting extended hallucinations or of yielding to the impulse to a dangerous action.

The explanation of suggestion and at the same time of its exaggerated form, hypnotism, must evidently go back to those mechanisms which we found at the bottom of inhibition. Actions exclude one another because they are antagonistic. The suggestion simply helps one motor impulse to inhibit its antagonist. It opens the channels of action in the suggested direction. The results appear surprising only if we forget how endlessly complex the psychomotor apparatus really is. If we disregard this complexity we may easily have the feeling that one person has an unexplainable influence over another. But as soon as we see

that every action is the result of thousands of psychomotor impulses, which are in definite relation to antagonistic energies, and that the result depends upon the struggling and balancing of these processes, we understand how small outer influences may help the one or the other side to victory. As soon as the balance turns to the one side, a completely new adjustment must set in.

If an action is proposed for which no antagonistic impulse exists, the idea of the action leads to its realization without any element of suggestion. If the idea of the proposed action arouses an antagonistic impulse which is strong, the proposition will not be carried out. But if the individual is by nature suggestible or is brought into a state of increased suggestibility, the antagonistic impulse will be powerless. We can define a suggestion as *a proposition to action which overcomes the antagonistic impulses*. To be suggestible thus means to be provided with a psychophysical apparatus in which new propositions for actions readily close the channels for antagonistic activity. The suggestive influence of the individual consists in his power to arouse a state of suggestibility in other men by appealing to their imagination or their emotion. A feeling of confidence, of respect, of admiration, but also of fear helps toward this result. The most complete submission must follow when a high degree of natural suggestibility on the one side coincides with a powerful suggestive influence on the other side, especially in a situation which arouses emotional expectations such as hope or fear.

Imitation and Sympathy.—The typical suggestion is given by words. But the impulse to act under the influence of another person arises no less when the action is proposed in the more direct form of showing the action itself. The submission then takes the form of imitation. This is the earliest type of subordination. It plays a fundamental rôle in the infant's life long before the suggestion through words can begin its influence. The infant imitates

involuntarily as soon as connections between the movement impulses and the movement impressions have been formed. At first automatic reflexes produce all kinds of motions, and each movement awakes kinesthetic and muscle sensations. Through association these impressions become bound up with the motor impulses. As soon as the movements of other persons arouse similar visual sensations the kinesthetic sensations are associated and realize the corresponding movement. Very soon the associative irradiation becomes more complex, and whole groups of emotional reactions are imitated. The child cries and laughs in imitation.

Most important is the imitation of the speech movement. The sound awakes the impulse to produce the same vocal sound long before the meaning of the word is understood. Imitation is thus the condition for the acquiring of speech, and later the condition for the learning of all other abilities. But while the imitation is at first simply automatic, it becomes more and more volitional. The child intends to imitate what the teacher shows as an example. This intentional imitation is certainly one of the most important vehicles of social organization. The desire to act like certain models becomes the most powerful social energy. But even the highest differentiation of society does not eliminate the constant working of the automatic, impulsive imitation.

The inner relation between imitation and suggestion shows itself in the similarity of conditions under which they are most effective. Every increase of suggestibility facilitates imitation. In any emotional excitement of a group every member submits to the suggestion of the others, but the suggestion is taken from the actual movements. A crowd in a panic or a mob in a riot shows an increased suggestibility by which each individual automatically repeats what his neighbors are doing. Even an army in battle may become either through enthusiasm or

through fear a group in which all individuality is lost and everyone is forced by imitative impulses to fight or escape. The psychophysical experiment leaves no doubt that this imitative response releases the sources of strongest energy in the mental mechanism. If the arm lifts the weight of an ergograph until the will cannot overcome the fatigue, the mere seeing of the movement carried out by others whips the motor centers to new efficiency.

We saw that our feeling states are both causes and effects of our actions. We cannot experience the impulse to action without a new shading of our emotional setting. Imitative acting involves, therefore, an inner imitation of feelings too. The child who smiles in response to the smile of his mother shares her pleasant feeling. The adult who is witness of an accident in which some one is hurt imitates instinctively the cramping muscle contractions of the victim, and as a result he feels an intense dislike without having the pain sensations themselves. From such elementary experiences an imitative emotional life develops, controlled by a general sympathetic tendency. We share the pleasures and the displeasures of others through an inner imitation which remains automatic. In its richer forms this sympathy becomes an *altruistic sentiment*; it stirs the desire to remove the misery around us and unfolds to a general mental setting through which every action is directed toward the service to others. But from the faintest echoing of feelings in the infant to the highest selfsacrifice from altruistic impulse, we have the common element of submission. The individual is feeling, and accordingly acting, not in the realization of his individual impulses, but under the influence of other personalities.

This subordination to the feelings of others through sympathy and pity and common joy takes a new psychological form in the affection of tenderness and especially of parental love. The relation of parents to children involves certainly an element of superordination, but the

mentally strongest factor remains the subordination, the complete submission to the feelings of those who are dependent upon the parents' care. In its higher development the parental love will not yield to every momentary like or dislike of the child, but will adjust the educative influence to the lasting satisfactions and to the later sources of unhappiness. But the submission of the parents to the feeling tones in the child's life remains the fundamental principle of the family instinct. While the parents' love and tenderness means that the stronger submits to the weaker, even up to the highest points of selfsacrifice, the loving child submits to his parents from feelings which are held together by a sense of dependence. This feeling of dependence as a motive of subordination enters into numberless human relations. Everywhere the weak lean on the strong, and choose their actions under the influence of those in whom they have confidence. The corresponding feelings show the manifold shades of modesty, admiration, gratitude and hopefulness. Yet it is only another aspect of the social relation if the consciousness of dependence upon the more powerful is felt with fear and revolt, or with the nearly related emotion of envy.

Aggression and Selfexpression.—The desire to assert oneself is no less powerful in the social interplay than the impulse to submission. Society needs the leaders as well as the followers. Selfassertion presupposes contact with other individuals. Man protects himself against the dangers of nature and man masters nature; but he asserts himself against men who interfere with him or whom he wants to force to obedience. The most immediate reaction in the compass of selfassertion is indeed the *rejection of interference*. It is a form in which even the infant shows the opposite of submission. He repels any effort to disturb him in the realization of the instinctive impulses. From the simplest reaction of the infant disturbed in his play or his meal, a straight line of development leads to

the fighting spirit of man, whose pugnaciousness and whose longing for vengeance force his will on his enemies. Every form of rivalry, jealousy and intolerance finds in this feeling group its source of automatic response. The most complex intellectual processes may be made subservient to this selfasserting emotion.

But the effort to impose one's will on others certainly does not result only from conflict. An entirely different emotional center is given by the mere desire for *self-expression*. In every field of human activity the individual may show his inventiveness, his ability to be different from others, to be a model, to be imitated by his fellows. The normal man has a healthy instinctive desire to claim recognition from the members of the social group. This interferes neither with the spirit of coördination nor with the subordination of modesty. In so far as the individual demands acknowledgment of his personal behavior and his personal achievement, he raises himself by that act above others. He wants his mental attitude to influence and control the social surroundings. In its fuller development this inner setting becomes the ambition for leadership in the affairs of practical life or in the sphere of cultural work.

The superficial counterpart is the desire for *selfdisplay* with all its variations of vanity and boastfulness. From the most bashful submission to the most ostentatious self-assertion, from the selfsacrifice of motherly love to the pugnaciousness of despotic egotism, the social psychologist can trace the human impulses through all the intensities of the human energies which interfere with equality in the group. Each variation has its emotional background and its impulsive discharge. Within normal limits they are all equally useful for the biological existence of the group and through the usefulness for the group ultimately serviceable to its members. Only through superordination and subordination does the group receive the inner firmness which

transforms the mere combination of men into working units. They give to human society that strong and yet flexible organization which is the necessary condition for its successful development.

B. THE COMPLEX SOCIAL PROCESSES

CHAPTER XIX

ORGANIZATION

The Individual and the Social Mind.—We have singled out those processes in the individual minds which are dependent upon the coexistence of men and which at the same time serve the formation of social groups. We spoke of the individual differences by which one mind is set off from others. We discussed the mutual attraction of these different minds and finally the emotions and impulses which subordinate or superordinate one mind to others. Seen from the standpoint of the social group every one of these individuals with his mental acts appears as an artificially isolated fragment. The combination which results from their approach, submission and selfassertion is the reality with which the social psychologist is concerned.

His interests naturally refer to two aspects. He asks how the real social groups become organized, and, secondly, how these organizations work. His problems are the structure and the development of society. But we must not forget that the social functions which we studied are not the only activities which enter into the functioning of the social group. The individual differences of men, their mutual approach, their submission and selfassertion secure the organization and through it the working of society, but they are certainly not the only events which are involved in the life of the social group. The individual does not cease to stand in the midst of nature when

he enters the social group. His personal life with all its reactions toward the non-social world is necessarily included in the group as a whole. The development of the human aggregate in its complex form includes, therefore, the individual processes as much as the strictly social processes.

But we must consider one more factor of utmost importance. It may be brought to sharpest relief, if we *compare the social mind with the individual mind*. Such a comparison is not meant simply as a metaphor. It is a true, far-reaching analogy, an account of really corresponding processes, and a careful tracing of the similarities can really help us to understand the one through the other. In our individual consciousness, the elements were the sensations and their combination was effected in the mind by association, their superordination and subordination by reënforcement and inhibition. In the social mind the elements are the individuals; their combination is secured by their approach and intercourse, their superordination and subordination by submission and selfassertion. The unity of personality in the individual mind finds its analogy on the social side in the unity of the social group, ultimately of human civilization as a whole. This was the underlying thought throughout the discussion.

Moreover, we have on both sides *an analogous physiological basis* for the mental process. Each mental element in the individual is based on the action of a brain cell, and these brain cells are connected with one another by cellipetal and cellifugal fibers. In a corresponding way the element of the social group, the personality, has as its physiological basis the whole individual brain, and these brains are connected with one another through the centripetal and centrifugal parts of the bodies. Each neuron of the central nervous system has its receiving nerve fibers by which it is stimulated from other cells, and its transmitting fibers by which it sends its messages to other cells, but no

two cells are grown together. They are only in such neighborhood that the excitation of one can stir up and communicate excitation to the next. The analogy is evident: two individuals are never grown together. There is a "synapsis" between any two brain neurons, and the same "synapsis" between any two social neurons. But in all communication and intercourse the individual transmits by his motor apparatus, his muscles, and the next receives by his sensory apparatus, his sense organs.

So far the analogy is simple. But the social psychologist who carried the comparison no further would leave out two elements of the individual process which we recognized as fundamentally important for the understanding of the psychophysical mechanism. Only if we trace the counterparts of those two factors can we arrive at a true, psychological understanding of organization and development in the social group. We recognized firstly that the interplay of the elements in the individual mind can never be understood as long as only the direct connections between the psychophysical processes are considered. All the life experiences of the individual are preserved in dispositions of brain cells which are acting without conscious accompaniment. They shape our decisions, they represent our knowledge, they make our lips speak before we have the words in consciousness. In short, all the actions of our mind consist not only of the mutual influence of the mental elements, but still more of the coöperation of those brain cells through which the million-fold psychophysical short cuts are established and which outside of consciousness perform the services of mental connections. They remember for us; they think for us; they will for us.

We have a perfect analogy to this situation in the objective elements of mental communication between individuals. A letter, a newspaper, a book, exists outside of the individuals themselves, and yet it intermediates be-

tween two or between millions of persons in the social group, just as a not conscious cell process intermediates between two neurons. The book remembers for the social group, and the experiences of the group, objectively recorded in it, shape the social action and the social thought. The letter can connect any distant social neurons; the paper may distribute the excitement from one point of the social group to millions of others. Every objectified expression becomes a social short cut. As any psychophysical explanation of the individual mental life must give attention to those unconscious brain processes, the explanation of the social mind necessarily involves the objectified records of experience and suggestions which intermediate between individuals. They are an organic part of the psychophysical mechanism of the social group.

Yet the second factor is no less important. The individual's mind cannot be understood as long as only the interconnection of the brain cells is considered, even if the not conscious cell activities are added. We have put the chief emphasis on the further fact that the psychophysical brain function is always the starting point for external action. Those millions of brain cells are coöperating in producing muscle contractions and gland activities and blood-vessel changes; and they themselves are again influenced by these external results. The brain cells cause the contraction of the muscles in the arms or fingers, and these contracted muscles awake new sensations in the brain cells. The interplay of the mental states demands this constant reference to the products outside of the brain.

We have the analogous process in the productions of the social group. They evidently take the form of the *social institutions*. The millions of individuals coöperate in producing the institutional civilization; the administrative and the legal institutions, the educational and the religious institutions, the economic and the technical institutions, result from the action of the social neurons. But every

change produced in these institutions has its influence on the social group itself. It is a constant interchange between the organized group of individuals and their institutional products. If we were to carry the action theory to its social consequence, we should say, moreover, that not only does the resulting institution become the source of influences on mankind, but that the production itself changes the producers, just as the motor impulse in the individual shades the sensory process from which it starts. The subconscious brain processes, and the peripheral bodily processes outside of the brain, are the two great classes of activities which are essential for the explanation of the individual mind. In exact correspondence the functions of the intermediating records and the functions of the institutional products are the two great realities outside of the individuals, without which the social mind cannot be explained. The mere associationism must be overcome in social psychology, just as much as in individual psychology.

Involuntary Combinations.—Our survey of the various organizations which are actually formed by interrelated individuals must be short. We cannot enter into a real analysis, but we may at least point to the significant differences of various forms. If we draw lines of division, they cross one another frequently. Above all, any two classes which we may distinguish may overlap; only their extreme forms are sharply different, while many intermediate forms can be found. We may draw such a line between the *involuntary* and the *voluntary* grouping. But a no less characteristic difference is that between the *temporary* and the *lasting* organizations. We may also distinguish between those groups the members of which are in *immediate* contact in space and those where *indirect* intercourse exists. Or we may separate the groups which are held together by a *personal* relation and those in which the objective social *institutions* play an essential rôle.

Again we have a fundamental difference between organizations in which the association of individuals is conspicuously controlled by the individual achievements of one or of a few persons, as against those in which all are on the same level.

Every individual can, of course, belong to any number of groups, as long as they are not antagonistic. He can belong to only one social class or to one race or to one profession, to one sex or to one party; but he can be a member of many clubs, take part in many meetings, and trade with many merchants. The psychologically still more important aspect is that he belongs at the same time to his family group and the national group and the party group and the church group and the group of the educated and the group of his profession, and perhaps to the group of the music lovers and the chess players and a hundred other mental organizations. No one group absorbs his whole personality; he is a member of each group only with a particular set of psychophysical functions. The same individual can become a part of as many interpersonal organizations as a sensation can become a part of perceptions and ideas.

We may turn first to the involuntary combinations. There is no reason to withhold from them the term organization, as this does not necessarily demand an intentional plan. The individuals in a beehive are organized, and a living body is an organism, because its cells are not only an aggregate, but an organization. As soon as the parts are in mutual dependence and a change in one part involves changes in the others, we have the conditions of organization fulfilled, even if it is planless and loose. Among the unintentional combinations the fugitive chance groups may be separated from the permanent ones. The most superficial form of the involuntary, fugitive combination is found where the members of the group have a common purpose, but where the realization of it is entirely

independent of the existence of the other members. The passengers in an electric car pursue their interests without reference to one another. Yet a blockade which makes each one impatient at once creates through this community of slight emotion, a group consciousness to which the individual submits the more fully the more suggestible he is. The spectators at a theater, the audience at a lecture, the witnesses of a street accident, are all in this state of original indifference to one another; and yet through the awareness of the identity of purpose they approach one another. Their suggestibility increases, and this reënforces their imitateness. The more the performance or the speaker inflames their emotion, the more complete becomes their mutual submission, until any signal for applause may make them all applaud. But this condition may be at the same time most favorable for subordination to a leader. A street crowd swept by the same emotion is easily organized; the initiative of a few may lead the mass to actions which the average member of the crowd in isolation would not have chosen or even which his reason or his taste or his morality would have resisted. Processes of organization of this type reach their climax in a riot where common indignation binds the members for a common attack, or in a panic, where common fear breaks down all resistance to the mass suggestion.

The extreme contrasts to such explosive coöperation are those involuntary organizations which bind men for life. These relations may be firm and personal like those between parents and children, or loose and impersonal like those between the members of a race. Neither the race nor the family is an intentional organization; they have developed from natural growth, and yet the individuals are bound together by mental ties. The psychical functions upon which the relation from person to person depends characterize the whole resulting organization. When Americans and Australians meet, they feel themselves members

of the worldwide organization which is held together by the use of the English language. Each has the immediate feeling of understanding the other and of being understood by him. To this organization the Russian would be a stranger. A feeling of linguistic kinship produces a setting of the psychophysical system which secures a peculiar kind of mental unity. But if a number of Americans meet in Australia, they feel the Australian to be the outsider. They belong to that group of citizens of the United States, and an entirely different psychophysical setting makes them feel themselves to be members of a definite social group. Common memories of a historic national past, common attitude toward the ideals of law and politics, common pride in their country, and common hope for its future, secure a mental interrelation which is fundamentally different from the linguistic bond. Yet this psychological setting, which prepares an inner coöperation with every American does not exclude a certain antagonism between the white and the colored American citizens. On either side racial habits fusing with common joyful or painful memories and with common prejudices, produce a mental attitude which excludes from the psychical group those whom national consciousness includes in the mental community. Again among the white Americans those of Irish descent feel themselves a psychical group as against those of English descent, and among those the poor ones feel themselves as belonging together in contrast to the rich.

But any of these affiliations may be crossed again by common professions, common interests, common personal experiences. The scientific chemist in New York feels himself nearer to the chemist in Berlin with whom he agrees in scientific theory than to the clergyman or to the shoemaker on the same street who does not even understand his chemical language. All the interpersonal connections constitute actual psychophysical organizations. Each is re-

sponsible for significant functions, which would not result, if the individuals were detached. From the primitive hordes and tribes of the savages to the social classes and professions of large cities, from the narrow-minded public opinion of a little village community to the moral consciousness of civilized mankind, psychological organizations are shaped by the natural interplay of ideas, feelings and impulses; and the social psychologist must study them in the same way in which the student of the individual mind examines the smaller or larger clusters of sensations.

Intentional Combinations.—The subordination and superordination which shades the naturally developed groups easily leads to systematic planning. A common impulse forces a group of men into a new movement, a new fashion, a new crusade; but while they are attracted to one another merely by this feeling of community, their natural submission to the prestige of a leader tends to take the form of a worked out organization. We need not think of statutes and programs, of party platforms and national treaties. The will character of the combination may exist no less in the case of the smallest and most fugitive group. If two strangers meet and begin a conversation, the fleeting interplay of questions and answers binds them into a social group created by the distinct purpose of the participants. If children combine in a game, the association is not a chance product but the result of intention. The group is dissolved when the purpose of the common game has been fulfilled; but as long as the group lasts, it has all the features of a psychophysical organization. All social entertainments, all class instruction, are controlled by such ideas of passing purposes.

We said that the spectators at a theater do not seek one another; they are unintentionally grouped together. But the spectators plus the actors form an intentional organization; they demand each other. Above all, our economic life consists of innumerable intentional organizations

from the smallest to the largest. A factory with its highly complex organization, held together by the purpose of manufacturing, the simplest workshop, the store, the partnership of two, and the market organization of the whole country, are all built up by functions of submission, self-assertion, imitation, common individual desires and mutually supplementing individual differences, held together by the purpose to effect certain commercial or industrial transactions.

Every great cultural purpose demands this manifoldness of social units, of which the smaller become elements of the larger, just as in the individual the ideas become parts of thoughts and the thoughts parts of theories. Every local political party enters into the large party and that into the political life of the nation, and the nation into the international concert. Involuntary and voluntary formations penetrate one another and fuse. The involuntary union in love is harmonized with the purposive union in marriage. Every community thus presents an inexhaustible wealth of involuntary and voluntary combinations, fleeting and lasting, loose and firm, narrow and wide, all influencing one another in harmony or by interference.

CHAPTER XX

ACHIEVEMENT

The Biological Aspect.—The social organization itself is never the end of the social process. The groups are formed intentionally to produce a definite result, or unintentionally with the objective effect that something is achieved by coöperation. Two children may sit down for a game of checkers; ten thousand workingmen and superintendents may be organized in a factory for the production of electric lamps; fifty million men may be organized politically in a state for the creation of laws. Every time the processes which simply establish the group as such and hold the group together and organize it for a unified action can be distinguished from the functions by which the organization achieves its results.

Only through these productive functions does the group gain its *biological usefulness*. We explained the sensory functions of the individual biologically by their being connected with actions. This sensory-motor process as a whole is useful, while any part of it would be without value for the adjustment of the organism; and only what is useful admits of biological explanation. The same principles can be applied here for the social organization. The group survives in the struggle for existence on account of the useful adaptation of its achievement to the conditions under which it is organized. Not surviving does not mean here that the individual members are destroyed, but that the group as such is lost. A social group or a political party or a business corporation may go out of existence and lose its organization on account of its ill-adjusted achievement

without the biological destruction, the death, of the individuals.

From such a biological standpoint it appears evident that the social achievement of human groups has a long preparation behind it. The herds of animals, the flocks of birds, the swarms of bees, are united by elementary impulses and reactions, and these impulses are bred by nature on account of the useful achievement of the groups. Above all, the feeding and rearing of the newborn animals must be considered as a mental function of the mating group. Moreover, as the comparative psychologist contrasts not only the mental life of the human individual with that of the animal, but also contrasts the various stages from infancy to maturity, the social psychologist too may compare not only the aggregations of men with those of beasts, but the various stages in the development of mankind from savagery to mature civilization.

The biological aspect, finally, also suggests the comparison between *the normal and the abnormal groups*. We recognized that a mental disturbance in the individual may result from the destruction of the psychophysical elements or from their faulty functioning in relation to one another or from external disturbances such as poisons produced by the glands of the body. All these three forms may interfere too with the functions of the social aggregate. A tribe, a race, a nation, may decay because its smallest parts, the individuals or the families, have become worthless or are dominated by destructive habits—do not raise children or are ruined by vicious mental impulses like overindulgence in alcohol. But it may also be unable to survive because the members interfere with one another, exhaust themselves in revolutions and massacres, or injure one another by graft and corruption, lack of public spirit and recklessness. And, thirdly, a community may be destroyed by an external influence, an enemy or an imported social poison, customs and beliefs which do not fit the

people and which undermine their vigorous energies. The psychopathology of the social functions from a quarrel of playing children and the breaking of a marriage tie in divorce to the disruption of churches or wars between large nations, is the necessary counterpart of social psychology. And here too the organic disturbances in which the elements are destroyed and become unfit for a renewing of the social organization, must be separated from the functional disorders in which the removal of the irritation can lead to a reestablishment of the original unity.

Material and Methods.—Exact material will be most available in the form of industrial statistics, moral statistics, political statistics and so on. The social psychologist, however, may also gather material from selfobservational analysis by the individuals who enter into a social group. It is even not impossible to create such groups artificially and to examine these questions by experimental laboratory methods. Miniature models of social groups are used in order to observe the development of the social psychological function. Experiments on suggestion or imitation appear almost like experiments in individual psychology, and yet belong strictly to social psychology.

The social character is more prominent in experiments on intentional deception, on the unveiling of hidden thought, or on the coincidence of associations in several individuals. More complicated experiments lead to the study of the thought processes in question and answer or in artificially simplified conversations. Other experiments have been carried on with reference to votes and the mental effects of discussions before the voting, or with regard to the growth of rumors and the changes of narratives which spread from one individual to another. Into the same group fall experiments on the school work of children who work in classes as compared with their home work, or on the efficiency of workingmen in contact with one another as compared with their achievement when they are

isolated. The laboratory study of social psychological phenomena is certainly still at its very beginning, but the various efforts made so far suggest that it may be no less successful than the experimental psychology of the individual. Beside the experiment the questionnaire method has been successful in securing valuable material for the analysis of group processes.

Finally we may reconstruct the functioning of the social group from the completed and detached products of its life. The development of the languages and of the legends which are witnesses of past civilizations, can well be understood as the outcome of mental functions which depend upon personal contact. But even where individual personalities must have originated the creations by independent thought, as in politics or art, in law or technic, the final products are reflections of a social functioning. The laws and the literature, the churches and the cities, tell the story of the working of social groups.

The Types of Social Achievements.—While the aim of every social group is the production of new achievements, this creative function may be preceded and supplemented by *assimilative functions*. The group must acquire knowledge and abilities and be aroused to certain interests in order to proceed to its progressive activity. It must absorb the traditions which secure the continuity of its organization; it must become versed in the customs; it must be imbued with the belief in its own significance and mission. This finds its fullest expression in the most fundamental group, the state, in which the submission to the laws and the customs of the country, the acquiring of its language, the understanding of its history and of its traditions, and the patriotic belief in its honor and its mission in the world blend to secure effectiveness. Yet the smaller groups, the essential ones like the family, and the most superficial ones like a club, depend upon assimilation to become productive. Of course in the midst of a large

group, which demands division of labor, this assimilative function may be detached and isolated: the schools and the nurseries and the patriotic festivities are small groups within the large group of the state, which serve this preparatory function. In the same way a trade has its apprentice courses and a church its Sunday schools. Even the play of children trains them early for the social interplay of the adults.

Everyone of these social functions can be resolved into mental processes in the individual; and yet the coöperation, the subordination and the superordination which are involved in the assimilative process, make the group function even in the simplest case something entirely different from a mere summation of the individual activities. The teaching of the adult and the learning of the child are dependent upon the consciousness of mutual reaction. The selfassertion of the teacher and the intellectual submission of the pupil must intertwine not only as two objective causes for the resulting effect, but the teacher must feel the attitude of the pupil, and the pupil that of the teacher. Yet to a certain degree this reaction may become onesided. The assimilation process may start from the lifeless product, the printed book, the painting, the building. The spirit of a personality speaks to the reader or spectator; and yet the reaction may no longer reach the author or artist. To-day we may still enter into a mental group with Plato and assimilate the idealism of his dialogues, as we cannot absorb his thoughts without associating with them the idea of his personality and feeling the attitude of submission to the suggestive power of his expressions.

As every sensory combination in the mind leads to characteristic motor settings and actions, every social organization of minds leads to *new social influences and productions*. A little chance group may amuse itself with a game, or may settle a discussion. The enjoyment gained and the intellectual agreement secured are actual products

of the organized mental intercourse. Workingmen helping one another to lift a load too heavy for one produce a momentary external effect. The significance of the product grows with the lasting character of the group. The lifework of parents who mold and shape the morals and intellect of their children stands before us as the highest type of achievement of the lasting small group. On the other hand the importance of the product may grow with the enlargement of the group, even if the result is fugitive. The caprice of a few is insignificant, but if wide circles organized as classes turn their common interest in one or another direction, we see the powerful products of public opinion, of fashion, of mass movements. But above these passing fancies of the crowd we see the true common achievement of the communities organized in political, economic, religious, scientific, artistic and professional groups. The organization of the state secures defense against its outer enemies by its armies, and prosecution of its inner enemies by its criminal courts. The economic organizations supply and distribute food, shelter and clothing; cultural groups produce new scientific and artistic, moral and religious thoughts which crystallize in lasting works. An unceasing creation through the medium of social organization necessarily results, and builds up the civilization of mankind.

The higher the level of development, the more we see personalities taking the *leadership*. Their individual imagination, their constructive power and inventiveness, their bold reasoning and their productive talent, aim toward new goals and strive for unheard-of values. Behind every great movement in modern statecraft or in engineering, in hygiene or in art, stands a great political mind or a masterbuilder, a scientific genius or a great esthetic seer, even when millions are following his lead. Yet the social psychologist has no right to put the emphasis on this independence and originality of the in-

ventor. Psychologically he is above all the product of his time, and therefore part of the social group. His most daring innovation is only slightly removed from the consciousness of the community, if compared with the mental products of other cultural levels. Even the greatest inventor is, first of all, a great selective imitator, and his achievement is dependent upon the means of expression and the objective treasures of civilization in which the mental life of the surrounding and of preceding generations have discharged their psychical activity. Men of the genius of Kant and Goethe and Beethoven may have been born among the old German tribes two thousand years ago as well as among their descendants of a later century, but the Beethoven of that time would simply have beaten the drum better than his neighbors. The musical genius needed a development of the acoustical technic through twenty centuries of musical production before the boldness of his tone imagination could revolutionize the esthetic world.

But the full process of civilization does not end with the production. The achievement itself becomes a starting point for new stimulation of the social organism. Whatever intellect or temperament or character have created is assimilated by learning and tradition, by enjoyment and belief. It enters into the customs and standards, into the educational equipment and the national spirit. The parents learn from the children, the teachers from their pupils, the nation from its servants. A continuous action and reaction leads to incessant progress. Every new stimulus irradiates over the social group, and through the co-operation of all its members new settings, new actions, new implements of civilization, new institutions, are created; and everyone of these in its turn works as a stimulus. The school, the court, the church, the market, the library, the city, are changed and renewed by the millionfold efforts of the community, and every change lifts or lowers the

community itself and influences its new striving. Hence the effect of every psychological enrichment of the social group and of every psychological deficiency rapidly grows through this circular process. With the change in strength or in weakness the group shifts its place in the larger groups to which it belongs, becomes submissive where it was selfasserting, or superior where it was subordinated. This ceaseless forming of new organizations in the plastic psychophysical structure of social mankind is the endless progress of civilization.

BOOK II. PURPOSEIVE PSYCHOLOGY



PART I. PRINCIPLES OF PURPOSIVE PSYCHOLOGY

CHAPTER XXI

IMMEDIATE REALITY

The Two Psychologies.—We have described and explained the world of mental processes. We began with the simplest elements which selfobservation discovers in the individual mind and traced their combinations in consciousness. Each elementary content of consciousness was accepted as an accompaniment of simple brain processes, and their interplay explained the structure and function of the whole personality. Finally we studied the combinations of these individuals in social groups and saw that these psychophysical groups are themselves again elements of the widest psychophysical system, the totality of human civilization. There may still be much dispute about the explanation of details; different theories may connect the facts in different ways; and above all, countless facts still demand faithful study before the explanation of the mental material can reach the level which the explanations of the physicist and chemist have reached to-day.

Yet however incomplete may be the picture which the causal psychologist can outline at present, he knows at least that no human mental function can exist which goes on outside of the causally explainable processes. It would be absurd for him to imagine that while most mental processes are explainable, some are of a different kind, demanding therefore a fundamentally different treatment,

for instance an interpretation and inner understanding. In popular psychology we are readily inclined to admit such a discrimination and to divide the mental phenomena into those which have causes and others which have a meaning. That is the easiest way; it seems only natural to stick to the principles of explanation when we deal with memory or with mental disturbances and to replace them with a kind of inner meaning when we turn to the feelings or the judgment, the will or the personality. The scientific student cannot be satisfied with such a see-saw psychology. The possibility of explaining mental processes is *not a discovery, but a postulate*. A mental process which cannot yet be inclosed in the causal system offers us an unsolved problem, and we know only that it can never be solved, if we give up the principle of explanation.

The physicist would never be satisfied with the fancy that certain molecules are not included in the physical universe which is governed by the physical laws. If he aims toward scientific knowledge of nature, he takes it for granted beforehand that every part of nature is controlled by physical causality. This by no means interferes with his right to see the whole universe from an entirely different point of view. From the depths of religious emotion, he may see it as the unfolding of a divine will. Then the world is full of miracles and symbolic actions; and this religious image of reality may be no less consistent and no less complete than that of physical science. How these two standpoints can be harmonized in the unity of a life philosophy is not our problem here. But a mixture of the two would be neither science nor religion. It would spoil physics by mysticism and would destroy spiritual religion by materialism.

We demanded at the threshold of our work that the psychologist be equally consistent. If he explains mental life, he simply presupposes from the start that mental life is explainable and that there is no corner of the mind

which his searchlight cannot reach. We had a right to propose a psychophysical explanation for will and emotion, for personality and social struggle and harmony. No fragment of mental life is left over. When the causal psychologist has made his inventory, nothing remains which is unsuited for explanation. Every human mental state from the first vague sensations of the infant to the highest cultural processes of the nations must have its place in the picture which we have outlined.

If nevertheless we are not at the end of psychology, it is evident that the study which lies before us does not refer to other mental experiences which lie outside of the realm of causal psychology, but to *the same inner life, seen from a different standpoint*. We characterized this doubleness of attitude before we began our causal analysis. We separated the aim to explain mental life from the fundamentally different aim to understand its meaning. These two ways of approach, however, are not related like those of the physicist and the theologian to nature. The religious view of the physical universe lies entirely outside of physics. It is not a physics of a different kind, but an act of faith, which has nothing to do with natural science. In physics itself only one standpoint is possible. But for the inner life two different standpoints must be acknowledged as justified in the midst of psychology itself, since both allow a purely theoretical and systematic understanding of the whole experience, and since both thus have the right to the term psychology. *Purposive psychology is not controlled by faith or imagination or intuition, but depends upon a thorough study and analysis of actual facts.*

We also emphasized from the first that the two pictures of mental life are combined in our daily intercourse. We may try to understand the neighbor who talks with us; and yet in the next moment, we may notice that he is losing the thread of the conversation, and we begin to think about the causes which produced that effect in his mind.

We may sympathize with his grief; and in the next instant consider by what mental intrusions we can effect a distraction of his mind. We may be impressed by his character; and yet at the same time theorize as to the inheritance elements in the make-up of his personality. The explanation of the loss of memory, the production of the distracting factors and the study of the inherited elements, belong entirely to the causal aspect. But the interest in the conversation, the sympathy with the emotion, the admiration for the character belong to our purposive treatment of the other man's mind. Our method was consistently to separate the two views and to begin with that which is usually treated as the view of scientific psychology, namely the causal. In doing so, we simply began with the mental life as an objective content of consciousness, which everyone finds in his selfobservation and which must be described and explained.

Causal Psychology and Reality.—As we now come to the purposive view, it seems essential to examine more fully the relation of the two views to the reality of our life. In order to have a foundation for the work in causal psychology we are satisfied with the colorless statement that we find perceptions and memories and feelings and volitions in ourselves, that they are contents of our consciousness and that the subject of consciousness is simply aware of them. That is indeed the situation which the causal psychologist faces and to which all his comparative and experimental, descriptive and physiological efforts refer. But is it really a situation which the immediate experience of life presents to us? Is not life essentially remolded when we speak of these perceptions and volitions as contents in ourselves? We came into the neighborhood of this problem repeatedly. We can no longer delay to examine it. But if we test these presuppositions of causal psychology, we must distinguish between the perceptions and ideas on the one side and the

feelings and inner activities on the other. The two cases are fundamentally different.

I perceive this room in which I am writing, and through the window the landscape before me. But have I really a right to say that I find all this as ideas in myself? Through the open window the song of a bird comes to me; I hear it. Is that song in me? Do I hear it in myself? Do I not hear it outside in the branches of the tree? And even if I remember the mountain I saw last vacation, what I have before me now is the beautiful mountain itself. I do not know it as something housed in myself at present. I feel that I enjoy at present its noble shape, but I do not find it as a memory idea closeted in myself. The things which make up our experience, the trees and stars, the tones and noises, and everything which we find in the world around us, in the world of the present and in the world of the past, have evidently been taken into ourselves by the theories of the psychologist and have been made into a bundle of our personal perceptions and memories. This is *a tremendous transformation of reality*, and nothing is more surprising than that it no longer surprises us. As causal psychologists we are indeed accustomed to sit at a table and to hold a book in our hand, and yet to describe both the book and the table as contents in our mind, as perceptions in ourselves.

But the other change is hardly less revolutionary. We claim as causal psychologists that we find the feelings and volitions and all the other attitudes and actions in our mind as something which we can observe. Yet this is certainly not a natural account of our immediate personal experience. *We feel ourselves acting* in those impulses and in those feelings of liking and disliking, but we do not find them like objects which we watch as spectators. We live through them as expressions and deeds of ourselves, and we do not become aware of them with the indifference of an onlooker. The same contrast forces itself on us, when

we speak of the inner life of other persons. We treat their will in causal psychology as if it were an object for their selfobservation, but in real life we surely have a much more immediate grasp of another man's will, if we understand it by entering into its meaning and purpose. If we agree with his decision or if we disapprove of his attitude, it would be entirely foreign to our instincts to think of those will acts as objects in his consciousness. We take another man's will as an immediate subjective expression as much as our own will. We feel that he wills his will, not that he finds it in himself as an observable content. We might call this knowledge of the will in another mind *an acknowledgment*. We acknowledge our neighbor as the subject of his acts; and again we have left the immediate reality far behind us, if we treat his attitudes as such objective material for his introspection. Moreover, we have handled his perceptions and memories as we did our own. We never find the newspaper which he is reading as a physical thing in his hand, and at the same time as a perceptive idea in his mind. We acknowledge only his reading of that paper before him and transform our experience of him by projecting a copy of the thing which he uses into his personality.

Scientific Reconstruction.—There can be no doubt that we have the right to proceed by such a method and to remold our inner life and that of all other individuals in our theories if it serves a valuable end of thought. The scientist is not a mere photographer. The physicist who considers outer nature as a combination of atoms speaks of elements which no one can see; and yet he has a right to reshape the experience of the outer world by such thoughts, because they are necessary for the fulfillment of his purpose, for understanding the universe as a system of causes and effects. We believe in the value of this end of thought and therefore we accept as truth those thought transformations of the world of experience which the

physicist needs in the service of his aim. The psychologist surely has the same right to go beyond the mere immediate experience of inner life, if important ends of thought can be served by it. We have seen what ends the causal psychologist strives to fulfill. He wants to understand the inner life too as a system of causes and effects and to recognize every experience as the necessary result of foregoing conditions, in order to foresee what will happen in the mind and to influence it. If this is the purpose, any reconstruction of the inner life which helps toward this goal must be welcomed as psychological truth; but it must not be forgotten that it is indeed a reconstruction and not original life reality.

The steps which the causal psychologist had to take before he could claim that mental life is made up of ideas and volitions which are contents of consciousness, material for objective introspection, can easily be retraced. If his purpose is to foresee how the individual will behave, to what he will attend, how he will feel about a new situation, what he will select, then he must, first of all, know what objects are within the reach of the particular individual. Hence from the world of possible things he cuts out those to which the particular person takes an attitude, which he notices or attends to or remembers or expects, and the psychologist *treats them as if they were all inclosed in the personality itself*. In the midst of psychological work we speak as if we had the room which we see as a content in our mind. But there are not two rooms, one containing us and the other contained in us. What we really mean is that we have an interest to consider this room only with reference to the fact that it is given to us and that we notice it, while we abstract from the fact that it also exists for every other man. We might say that we split the real perceived or remembered or expected thing into two artificial objects. The one which we think as being without in its original place keeps all which has no special relation to the individual and which is common to all: we call it the physical thing. The other part is the same thing in so far as it belongs in the sphere of our personal experience. It is

drawn into our personality itself. What things really are within his reach everyone can find out only for himself, and that is what we call selfobservation.

These real things which the causal psychologist splits into the physical and the psychical are the objects of our life interest, of our liking and disliking, of our preferring and rejecting. But if we consider the objects with reference to cause and effect only, the neutral attitude of a mere passive spectator is needed. As selfobserving, causal psychologists we have to stop our liking and disliking and have to eliminate our will toward the objects. We must simply take the psychical contents as objects of awareness. Then only can we study their connections in order to determine what will result from their interplay. The psychologist looks on the contents of the mind with a neutrality equal to that of the astronomer. As soon as the outer world is to us no longer the object, but is replaced by mere perceptions and memories of the world, an indifferent selfobservation takes the place of the original actions of will. The psychical objects are nothing but material of which we become aware.

But the causal psychologist certainly cannot leave the feelings and volitions out of play. The next necessary step in order to be loyal to his purpose must be to consider these inner activities also as contents of consciousness. This is easily taken, and every true selfobserver instinctively goes over to this scheme. What he really does is to substitute the inner perception of the organism for the feeling of the self. In our immediate reality of pulsating life, we know ourselves as the subjects of our will, which expresses itself through the actions of our organism. But if we give an introspective account of ourselves as objects, we must take this *organism as our real self* and the perception of its activities as the consciousness of the personal reactions. In our description and explanation of the emotions, volitions, and ideas of personality we have gone along this same way step by step. We did it there as if we found in those combinations of bodily sensations the real emotions and feelings themselves. Looking backward from a higher point of view we must recognize that all those introspective observations were ultimately remolded constructions. They were needed, because they alone allowed us to treat the functions of the self as describable objects and to

link them in the chain of causal events. The results, accordingly, were psychological truth, but they certainly led us far away from the immediate reality of inner life. It is this reality which must be analyzed and systematized by the purposive psychologist.

Purposive Understanding.—The contrast between the purposive interpretation and the causal description of the personal and interpersonal life is complete at every point. If we pursue the purposive routine of the day, our objects are not in us, but spread over the world, and our personality is not perceived, but acting. Another man is not the object of awareness but of acknowledgment. There is nothing whatever to be described, everything to be understood. And, above all, nothing is to be explained, because everything must be understood in relation to its purposes. The various activities are connected not by an underlying brain process, but by their internal relation. One idea means another idea, one will points to another will. But where there is no reason to ask for causes, we have freedom. In the world of causality, cause and effect can be expressed by equations; in the world of freedom and meaning, an inexhaustible creation, an unlimited heightening of realities is possible. In the world of cause and effect, nothing is good and nothing is bad, because everything is simply happening, and consciousness is a passive spectator: nature is always indifferent. In the world of freedom, the meaning and the will point to purposes which can be valued and every action can be measured by the standards of ideal purposes. The ideas and volitions gain logical, esthetic and ethical value.

On the surface it appears as if these two presentations of inner life contradict each other and as if the contrast could be overcome only by acknowledging the one as true and the other as untrue. But the experiences in the routine of daily life ought to warn us against such rash-

ness. We actually rely on both in every practical situation, and wherever we recognize the one at the expense of the other, we neglect certain life interests. The teacher may look on the pupil in the schoolroom as a free responsible individual and may understand him as a center of meaning. But if this were all, he would neglect the mechanism of that young mind; he might fatigue its will power, overburden its memory mechanism, neglect the hygienic conditions of its working and interfere with the processes of assimilation. On the other hand, the teacher schooled by causal psychology may look on the child only as a mental mechanism, where every change must be understood as an effect of the psychophysical causes and every thought and feeling be regarded as a content of consciousness. But if this were all, the best meaning of instruction would be lost. A naked calculation of causes and effects would intrude where personal sympathy and personal tact ought to control the intercourse. The ideal value of the instruction would be lost. The child would be to the teacher nothing but a case of psychophysical activity instead of being a free individual with growing responsibility worthy of personal interest.

This relation between two or among millions repeats itself in every significant phase of social life; it is ultimately not different in our own intercourse with ourselves. We feel our self as a purposive personality, responsible for every thought and mood and intention and judgment, and yet we may take our minds as mechanisms in which the inherited dispositions and the influences of life have made us the necessary products of causes and have aroused the particular ideas and moods by association in our consciousness. We are free and we are bound, but we are not free in some parts of our mind and bound in others; we are free throughout and bound throughout, in accordance with the attitude which we take toward ourselves. If we live our life, the world is to us an object of our free activity,

is means and purpose, but the act starts with our inner deed, and everything is related to our aims. If we explain our life, our mind is throughout the effect of causes, and every will act is determined by preceding processes. Whether we take the one attitude or the other depends upon the purpose of our thought.

If these tendencies of practical life are carried to their extreme systematic form, they lead to the two developed systems of psychology, the causal and the purposive. But as soon as their character is recognized, the illusion that they are interfering with each other or that the truth of the one is proof of the untruth of the other must disappear. Both are valuable and significant and both fulfill the meaning of truth. They offer different aspects of the same life, and they agree with each other as well as the physicist's and the chemist's and the mathematician's accounts of the same physical object harmonize.

Yet if we come to the last word, we must finally recognize that while the two psychological systems are equally true, they are not coördinated. One treats man as an object, the other as a subject. Popular thinking is first attracted by the objects which can be touched and handled, and is therefore inclined to take the world of objects as the true world upon which all the subjects depend. The philosophically trained mind emancipates itself from such superficiality, and must insist on the opposite answer to the problem. We do not first find our inner life as an object, but we know it immediately as our purposive deed. We see it stretched out before us as a series of objects only if we purposively seek to understand its causes and effects. The objective appearance is therefore entirely dependent upon our subjective act. *It is not the structure of mental objects which is the cause of our purpose, but it is our purpose which transforms our purposive life into a causal structure.* The deed of the subject is the first,

the causal interplay of the objects the dependent reality. *Our mental life is free, and through an act of freedom we decide to consider it as a mental mechanism in which nothing is free.*

CHAPTER XXII

THE SOUL

Purposive Acts and Causality.—When we discussed the principles of causal psychology, our central problem was the possibility of causal connection between the mental processes. The whole aim was to remodel inner life until it could be conceived as causally connected. We had to examine whether this linking could be conceived as direct or not. We convinced ourselves that a necessary connection between mental processes as such is unthinkable. We, therefore, had to reject also every theory which seeks the tie in unconscious mental processes. On the other hand, we found that the purpose can be completely fulfilled by coupling the mental processes with brain processes and seeking the direct causal connection between the underlying bodily events. This problem of connection must be the central one for the theory of purposive psychology, too. But the material which is to be connected is certainly very different now, since we try to grasp inner life as a meaning. The contents of consciousness with which causal psychology deals are objects, but the acts which have a meaning and which form the material of purposive psychology are acts of subjects. Hence if we contrast the mere material, we have in causal psychology mental objects which are found in consciousness, and in purposive psychology we have acts which are performed by a subject.

To understand a single act, that is, to grasp its meaning, to enter into the purposive expression of the self, is simply life, not science. Yet even life goes beyond this entirely

isolated grasping of the act. Whether we try to understand our neighbor's feeling and will and thought, or our own, we naturally go beyond that one particular act. We ask what it involves. If it is a thought, we try to understand the underlying ideas of the person who utters it; if it is an action, the character which expresses itself; if it is a feeling, the general emotional attitude. Moreover, we ask whether the act expresses the personality itself only, or whether it possesses an inner relation to ideas and feelings of others with whom the subject agrees and disagrees, whom he imitates or rejects. And if a number of meaningful expressions are before us, we ask how far they contradict one another, how far one thought necessarily includes another, how far one resolution necessarily binds the subject to come to a certain decision. In all these cases we aim toward a connection of one act with other acts in the personality.

Such connections in our daily life may be superficial, just as our ordinary causal connections of mental processes are very vague and inconsistent. But it indicates that a true understanding demands more than the grasping of isolated acts, and that a meaning involves the connections of one act with other realities in the purposive world. In causal psychology we proceed from the fragmentary chance explanations with which we are satisfied in our daily intercourse to a really systematic connection of all mental processes. In the same way we must proceed in purposive psychology from those superficial fragmentary connections of the purposive acts to a consistent and systematic linking of all elements of the inner life, in so far as it is material for our understanding.

If we strive for a complete connection of all inner purposive acts, that is, of the totality of our inner life in the form in which we live through it in our immediate experience, we must, above all, be sure not to fall back into the thought form of causality. *Inner life as we live it*

never comes to us as cause and effect. In popular thought exactly the opposite is not seldom proclaimed. We hear that our inner experience is the true source of the idea of causal connection. We feel our will as the cause of the movement of the body, and we project, it is claimed, this inner experience of causality into the world of nature and interpret the happenings outside by these inner impulses which make the physical world move. But this is a fundamental misunderstanding, which results from not discriminating between the inner life as an object to be observed and the inner life as a meaning to be understood. The will as we really experience it in our immediate life is never the prototype of a cause. Normally we do not even detach it from the bodily action and do not consider it as preceding, but take the movement as the expression of the will, not as an effect.

It is the outer world of physical bodies which leads mankind to the recognition of causes and effects, and if finally a standpoint is reached from which even the human will is treated causally, this psychologizing understanding of the will presupposes the long schooling through the study of natural science. Only when science had reached a high level did it become really possible to force the idea of causal connection even on the will, because the will could be resolved into sensations and feelings and physiological processes. But this scientific achievement of causal psychology marks the greatest possible distance from the immediate experience of the will which we live through. This will which has been resolved into its objective elements does not will anything, but is only an object of observation. The will which wills, and accordingly has meaning, lies in an entirely different dimension. It is quite true that man projects his inner will experience into outer nature, but where he is doing that he does not secure a causal explanation of nature, but only an inner interpretation. Nature itself then becomes a kind of human being.

The wind and the waves become living, and their movements are the expression of their will. From such a poetic or mythological personification of nature no direct bridge leads to causal, natural science.

The real will, grasped as an act which we can understand, occurs in our experience neither as a cause nor as an effect. If we are to bring it into connection with other realities, we must know beforehand that it cannot be causality which links them. Causality binds physical processes, and if the mental life is treated causally it ultimately becomes subordinated to the physical behavior of the organism, as we have seen in full detail. Our real inner acting creates the thought of causal connection, but is never subject to it. As soon as we have grasped this central fact, we understand how hopeless it is to try to secure a privileged position for the mind in the midst of a causal picture of the universe. Too many theories have been planned for this purpose. It is felt as a moral degradation to consider the interplay of the mind as dependent upon the physical processes of nature, and all kinds of loopholes are therefore left in the causal mechanism. The mental processes are treated as a special form of energy which can be transformed into physical energies as electricity can be transformed into magnetism. Or a mind substance is imagined which works as a causal mechanism of a higher order, producing some of the mental states as causal effects without the intrusion of physical processes.

Such efforts are not only doomed from the start because they work with unfit conceptions and destroy the system of causality which they are meant to build up, but above all the problem itself is meaningless. That inner life which man values and wants to see superior to the mere mechanism of matter is not the mind conceived in the thought form of causality. *The mere mental processes as such have no dignity, since they are not the real inner life, but are merely scientific constructions which we need as counters*

for our calculation. The inner life in which our duties lie and which alone has value is that which has a meaning and is understood as the expression of a subject. In this intentional character it does not admit at all the question of objective description and explanation.

Purposive Acts and Time.—To characterize the material of the purposive psychologist still more fully we may add that the acts of our inner life, if they are understood as the expression of a subject, are not contained in the time which is filled by physical things. If we mean by time exclusively that which the physicist means and must mean by it, then we even have a right to say that mental life in its reality is timeless. Of course my mental life goes on between the calendar dates of my birth and death. A thought may linger in my mind for several days, a joy or a fear may stir my mind through a sleepless night, and in the laboratory I may find out by exact measurement that one sensation group and reaction impulse takes a few hundredths of a second more than another. But in all these cases the mental experience is treated as a psychological process, made dependent upon the physical body which necessarily lives in physical time. The mental processes as objects of causal psychology are in time, just as they are in space. My thoughts last through the time which the clock shows, just as they are in this room in which I am sitting and are inclosed in the cells of my brain. But if I really grasp my thought in the act of thinking or my volition in the act of willing, it does not come in question with reference to these physical conditions either of space or of time. I know it only in so far as it means something, and the question of how many minutes this meaning lasts or whether it is in the front or the rear part of my brain is as pointless as if I were to ask whether my will is blue or green, salt or sour.

The acts are intimately related to the time of the physical world, as the self takes attitude through them

toward past and present and future. Those objects toward which our will is directed are present, those toward which we can no longer act are past, and those for which we can still prepare an action are future. The time values are distributed for the real subject by these purposive acts, but the acts are not in the time which they create. We have no right to say that the act occurs at the same time at which an event in the physical world occurs toward which the act is directed. The act is not simultaneous with it, nor does it precede it, nor does it follow it: it is itself outside of time, just as it is outside of causality. To be sure, there is an internal consecutiveness and progress in our acts. One act grows out of another, and in an entirely different sense we may project the unfolding of our real inner life into a purposive time, but that is certainly not the time of our calendar in which the stars move and in which our brain acts.

The Connection of Purposive Acts.—What do we really aim at when we seek a necessary connection between two experiences? Let us look back to the case of the physical world. We see that the mere regular succession of two physical processes could not possibly satisfy our demand for an ultimate understanding. We could not take it for granted that a succession would occur the hundredth time because it did occur ninety-nine times. Such practical observations of regular successions may serve us well for the routine of the day, because they make us expect similar happenings: but the discovery of such regularities is insufficient as the goal of scientific explanation. The ideal of physics is a natural mechanism in which every particle of an atom lasts. Every change results only from a change of position, and is affected by energies which last too. If nature can be understood in this way, then the successive phases of the natural process are really linked by necessity since we cannot think them otherwise. The connection between cause and effect is then no longer a mere adding

together of two processes which have nothing in common. On the contrary, cause and effect are then ultimately dependent upon the fact that the physical substance and the physical energies remain the same in every new phase of the world process.

The fact that every particle of substance and the energy of the universe remain the same is the only experience which does not need any further explanation. It is explanation in itself, because it is involved in our thought of the physical substance and its energies. We cannot think it otherwise, if we seek a consistent idea of nature. The world which we actually experience is a ceaseless flux and change. Our search for a world in which objects last and on which we can rely for our actions leads us to that construction in which the change is understood as a function of something which remains forever unchanged. This ideal is realized by the scientist's conception of nature. The search for causality finds a real logical rockbed only where the manifoldness is understood as an ultimate sameness: causality is replaced by identity.

The search for necessary connections in our real life, in our life of purpose and meaning, begins with the same motives and ends with the same results as the search of the causal scientist. The motive is here, too, to bring order into the manifoldness and to take a right attitude toward a single experience by embedding it into its whole setting. The result, on the other hand, is again that the apparent change is recognized, or rather reconstructed, as a system of identities. *Whatever remains the same does not need any further connection.* Yet what a difference between *the sameness of the atomistic substance in succeeding periods of time* and *the sameness of will purposes in the progress of inner experience.*

If we really seek to understand the continuity of meaning, we must energetically refuse every reminiscence of the continuity of objects. The will treated as a psycho-

logical content of consciousness does not last beyond the fractions of a second in which we perceive it; a new will act is an entirely new content. But its purpose may remain exactly the same: the will to affirm certain premises is identical with the will to affirm the conclusion. The one is involved in the other; the one means the other. They are connected in the purposive world, because they are ultimately the same. The meaning of the definition of a triangle and the geometric deductions from it are surely very different as objects of psychological selfobservation, but the acts of the subject who grasps them and proceeds from the definition to the geometrical propositions are necessarily bound together by the identity of meaning.

As in the world of nature every single process points backward to its causes and forward to its effects, in the world of purposes, too, every single meaning which we grasp in ourselves or acknowledge in others has its double face. It turns forward to all to which it may lead, and backward to that from which it grew. In dealing with nature we have the two interests alternately in mind. When anything happens, sometimes the causes attract our attention, and sometimes only the effects to be expected. In our life of purpose our interest fluctuates no less. An idea which interests us makes us consider what may result from it or from what ideas it sprung. In purposive psychology both questions must be answered systematically. Thus our general problem is: how can we think the self so as to understand every act as identical with other acts in the self?

Our statement that every meaning involves the reference to a self demands some further comment, which might easily lead too far into the midst of philosophy. We may grasp the meaning of an idea, of a judgment, of a demand, without referring it to a particular subject. The mathematical truth that three times three is nine has a meaning for us without being the purposive act of a particular individual. It remains a true

statement for us and makes our understanding independent of the question whether this or that person is making this mathematical affirmation. But ultimately this does not mean that it is without reference to a subject; it means only that the idea interests us without our having any interest in the question of which individuals are actively engaged in thinking it, because it is binding for the will of every possible individual. The philosopher, accordingly, would not detach it from a reference to subjective will, but he would relate it to a more than personal will, to the will of everybody who is to be acknowledged as a subject at all. He therefore discriminates between the purposive idea which interests us as the purposive expression of an individual self and that which is necessarily affirmed by every possible self and which can thus be thought without any reference to an individual person. Every logical statement, as such, has this more than individual relation: in logic we can entirely abstract from this relation to the subject.

The situation is completely parallel to that of the psychical and physical objects of consciousness. There cannot be any objects which are not objects for a subject, that perceives them. But only in the case of the psychical objects are we really interested in their being perceived by a particular individual, and we refer them therefore to a special subject. The world of physical objects, on the other hand, is no less a world of perceptible objects, but, as it contains the objects which are objects for every possible subject, we have no interest in asking what particular subjects are actually involved in the perceptions. We treat the physical thing, the stone, as something for which the question of being perceived by a particular individual may be entirely ignored. We speak of its objective existence in nature, as if this had no reference to the possibility of being perceived. The physicist abstracts from the perception of his objects, and the logician abstracts from the will reference of his truths, but ultimately this abstraction in both cases means that any possible subject can be substituted. Only when we deal with psychical contents of consciousness do we need the reference to an individual consciousness, and when we speak of psychical purposive acts, we need the reference to individual
selves

We want to understand the self so that its acts may be conceived identical with one another. The result must be a construction which as such goes beyond the actual experience just as the ether constructions of the physicist go beyond the observations of nature. The aim of this purposive construction is reached by the theory of the soul. *The soul is the self conceived as a system of purposes which remains identical with itself in developing its potential acts as real experiences* in response to the acts of others and to the objects of the world.

The Function of the Soul.—The idea of a purposive soul with spontaneous activity is as old as human thought about man's inner life. Every savage tribe on the surface of the earth has some word which may fittingly be translated as "soul." The dream in which the sleeper leaves his place and wanders afar, the mental disease in which man is not himself but controlled by another self, the death in which the self leaves the body, the reappearance of the dead in the dreams of the living, and many similar motives have led to the primitive soul ideas. The special form in which these conceptions were shaped throughout the history of mankind depended upon the background of general knowledge, the religious and the philosophical ideas and not least upon the imagination of the peoples and of their individual thinkers. At first it was essentially a man in man, a thinner, finer, shadowlike, breathlike man; and the motives which led to such constructions have never ceased to influence the masses.

Long periods of human thought were controlled by ideas which interpreted the soul as an indestructible simple substance. But however the forms of the soul have been conceived, a purposive, free mental agency has been at all times demanded by human thought, and never was really suppressed by the passing ideas of a mental mechanism after the pattern of natural science. Yet the consistent purposive psychologist recognizes that even the soul sub-

stance and every conception which has similarity to it, is still, to a large degree, under the influence of naturalistic ideas. The soul substances were constructed and are still constructed to-day, because the philosophers wanted to explain the mental actions; and they called the actions free inasmuch as the causes lay in the soul itself. But the whole question is wrongly put. If we really take the purposive attitude, we must be consistent and see that there is nothing to be explained, because the purposive reality is falsified, when it is brought into a system of causes and effects. It needs to be interpreted and to be understood, but not to be explained from causes, even though the causes lie in the soul itself. Our definition of the soul as a system of purposes avoids this fundamental mistake, and it satisfies every logical demand, as long as unjustified questions are not raised. If we are asked to describe this soul, such a misleading question is already before us. To describe reality means to treat it as an object, and a system of purposes which we understand in grasping their meaning can never be conceived as an object.

In the same way it would be entirely wrong to think that the soul is the cause of the movements of the body. This again would simply force us on the road to explanation. The psychophysical brain processes move the muscles, but in the purposive world the life of the soul expresses itself in the bodily movements without in any way suggesting the question of how these movements are effected. If the man with whom we are in intercourse really stands in a human relation to us and is not the object of observational interest, his bodily movements help us to understand the actions of his soul and do not come in question under any other point of view. Nor have we a right to ask how one soul can become the cause for actions of another soul. In the universe of purposes which alone interests the non-causal psychologist this effect does not occur. I know the purpose of my friend, or I do not

know it. The problem how I came to know it, that is, how his soul action entered my soul, raises again an issue of explanation, which is entirely foreign to our mutual understanding. All these questions of explanation must be placed where they belong; that is, in the realm of causal psychology.

How, then, can we characterize *the real soul*? It is *not causal*; it is *not in the physical body*; it is *not in the physical time*; it is *not a substance*; it is *not an object*. Positively, it is through all experience *identical with itself*. But, again, we must protect our statement against a naturalistic interpretation. The purposes of the soul do not simply go on like the molecules. It is not an outsider who decides that the soul in one act is identical with the soul in another act. The *identity is one of meaning*; one system of acts means another system of acts. In willing the one purpose the subject wills the other; and this posits his own identity. The soul is continuous as it wills itself in every act of experience as the same self. The soul is *self-conscious*, not as if it could be an object for itself, but because it affirms its own system of purposes in every new act. *The soul is free*, because it is not dependent upon any cause. *The soul is immortal*, because the biological phenomenon of death in the realm of space and causality cannot refer to a strictly purposive reality. The life of the soul is to be analyzed and its inner relations to be traced by the study of purposive psychology. It leads to the ultimate problems of mankind, since only the acts of the soul and not the causal mental processes can be related to the overindividual obligations of truth, beauty and morality. Only the soul, finally, and not the causal mental mechanism can be conceived as part of the absolute mind which embraces the individuals. But we must turn to its special functions. In the sphere of the causal we called the special parts the mental processes. In a purposive world there is no room for processes, as they

refer to objects. We ought to speak of experiences, as this term indicates better that every phase is related to a subject. We may now turn to the special experiences of the soul, separating again the individual and the social aspects.

PART II. THE INDIVIDUAL EXPERIENCES

CHAPTER XXIII

MEANING

Meaning in Practical Life.—The discussion of immediate experience and of the soul has brought us into the neighborhood of philosophic problems and this might easily reënforce the idea that the purposive mind is something vague, intangible and fictitious. The mind, as causal psychology describes it, appears concrete, real, and therefore practical, but the purposive acts which are not even linked with particular brain states seem to lie outside of all true experience, like some higher, spiritual energy, which can be reached by intuition only. But this is a complete misunderstanding. Nothing is more real, and nothing comes nearer to our actual life than the purposive aspect of our own mind and of those of our friends. In actual intercourse we do not doubt it, and only when we come to theorize we suddenly fancy that only the things which can be handled are real. We have gone so thoroughly into the school of natural science that we have almost lost confidence in the reality of everything which cannot be found among the objects.

But we need only the simplest practical experiment. We need only to exchange a word with our neighbor: he may say, "good morning," and I answer, "how do you do." His words and my words have meaning for me long before I can think of his or my content of consciousness. But we might make a much more objective test. Through five thousand

years *the literature of the world* has been filled with the story of the human mind. Histories have told us about the struggles of mankind, thousands of biographies and autobiographies lie before us, hundreds of thousands of aphorisms and epigrams, verses and proverbs, have thrown light on the subtle thoughts and emotions of men and women; and yet, if we sift this inexhaustible supply of observations, we find hardly one contribution to causal psychology in a hundred contributions to purposive psychology.

We may open a political paper or an economic treatise, a discussion on the trivial questions of the day or on the great issues of the parties, and we will find man's ideas and wishes, feelings and judgments, treated exclusively as acts which have a meaning for the self which experiences them, but not at all as contents of consciousness. They are interpreted, and secondarily appreciated or criticized, but they are not described as complexes of sensations or explained from underlying brain processes. The reader who wants to understand what one or another political candidate has in his mind asks for a mental reality which is completely understood as soon as its meaning is grasped, while nothing significant would be added, if the ideas of the politician were resolved into their mental atoms or explained scientifically from their causes. There is nothing to be explained in them, because our political interest in them refers to their inner life from a point of view from which we understand all as soon as we interpret it.

This aspect of inner life is also the only one which interests *the novelist*. The persons whom he delineates are never described as scientific phenomena, but set before our imagination as selves whose inner actions we are to understand by entering into their meaning. Whenever the author begins to describe the inner states of his hero in the manner of the causal psychologist and to explain his intentions from associative mental and psychophysiological

causes, his ambition for realism carries him beyond the limits of true fiction. It is a characteristic fact that no state of mind has been so often depicted in literature as that of love between man and woman, and that nevertheless the causal psychologist has as yet hardly touched this problem of love emotion. The explanatory study of it has only begun. What the poets celebrate is always love as a purposive act of the soul. The literary critic, too, who speaks of the psychological truth of the drama on the stage has in mind not the correctness of psychological description or explanation, but the genuineness and lifelike reality of the personal intentions of the characters. In short, mental life as the meaning of selves is not something more remote than the psychophysical phenomena: on the contrary, it is the most concrete, most immediate and most personal material which life offers to us.

Problems and Methods.—If we turn to the results which a thorough study and scholarly treatment of this material have yielded so far, they seem in pitiful contrast to the claims on which we have insisted. We called it not only the most immediate and most natural experience, but also the most significant way of looking on man. To treat man as an object, as causal psychology must always do, is much less important than to acknowledge him as a subject and to understand his meaning. But almost every scholarly effort has served so far the upbuilding of causal psychology. In earlier periods the interest in the human mind was essentially under the control of philosophy. The nature of the soul was the object of the discussion, while the study of the detailed mental facts had not come into its rights. The human ideas, emotions and actions were studied more from the point of view of logic, ethics, esthetics and metaphysics than from that of an original interest in the functions of the individual. On the other hand, when this new endeavor to study the special facts of the mind awoke, the natural sciences were at the height

of their success, and their suggestive power forced the naturalistic method on the empirical psychologists. The study of mental details at once became the study of the mind from a causal point of view, and all the experimental schemes were made subservient to the explanatory attitude. The abundance of new discoveries along this line held the attention of the psychologists. So it happened that the other possible direction to detailed analysis became almost entirely neglected. It is true that even the experimental work sometimes slipped into this other groove. Especially in the study of thought, judgment and apperception the experiments which were intended to seek objective description and explanation unintentionally raised the more natural question of inner meaning and purposive interconnection of the acts. But on such chance occasions the changing of the point of view leads only to confusion and to unjustified mixing of results.

The situation itself does not suggest the usual neglect. The careful research with all the aid of experimental and comparative methods may just as well be devoted to the purposive aspect of mental life. Laboratory work in this line would have an entirely different starting point, and would not be concerned at all with sensations, but would probably begin where the causal psychologists have ended, with the analysis of thoughts and emotions. This science of the purposive behavior of the soul may bring together in future just as many special facts as our handbooks of causal psychology can marshal to-day. At present it would be a vain undertaking to present even in outline the facts of purposive psychology. We shall, therefore, confine ourselves to a statement of the problems and their bearing.

Like causal psychology, which deals with the elementary contents and leads from there to the associations and reactions, and finally to the connection of the individuals in the social organism, purposive psychology, too, ought to begin with the elements and build up the totality of cul-

tural life. But the element is here certainly not a sensation; the element is the simplest act which cannot be resolved any further into still more elementary purposive activities. The indivisible acts of liking or disliking, affirming or denying, selecting or avoiding, believing or distrusting, each understood as a meaning, constitute the experience of the self. We then have to ask how they are connected and what they create.

Every reminiscence of causal ideas must be excluded. The connection and creation are themselves strictly purposive. One act links itself to another by its meaning, and in the creation acts are internally combined in a new act of wider significance. The analysis and discrimination of all possible single acts, the whole variety of possible interconnections and the whole manifoldness of new creations form the substance of the individual soul psychology. At this point begins the purposive social interrelation of various selves. This social part in an ideal purposive psychology plays a much larger rôle than in causal psychology. The social connection of the individuals is, from a causal point of view, rather secondary. The chief interest is naturally directed to the study of the individual. From the point of view of purposive psychology the relation of one individual to another appears much more in the foreground. The sensations and their associative combinations in man can be conceived without any reference to other psychophysical organisms. But the meaning, even of the most elementary act, leads almost necessarily to other individuals who are expected to understand it. The purposive man is, first of all, a member of a purposive community. The psychological analysis of these interrelations from man to man must begin with the act of understanding a self, and must then examine all the other practical relations which build up the historical and cultural community. It must finally lead to the study of the ideal acts which the individual

performs, not with reference to one or another chance person, but to the totality of possible individuals who share with him the ideal of building up a valid world of truth and beauty and morality.

The Pointing to an Opposite.—The first step ought to be a characterization of the acts themselves. We cannot be expected to describe them, as that would make them objects. We should become disloyal to our purposive task. But we can emphasize a characteristic contrast between every act and every mere content of consciousness. *An act always points to its opposite; a content of consciousness never has an opposite.* This difference is ultimately that between subject and object. As long as we move in the compass of causal psychology we can arrange a series, for instance, from the highest to the lowest tone, and can call the two ends opposites, but it is evident that the high tone contains in itself no opposition to the low tone. Even the case of the feelings is not different. We can form a series from the strongest pleasure to the strongest displeasure, and this series leads through a point of indifference, a feeling of neutrality. But this mere passing through a neutrality zone does not transform the two end groups of the series into opponents. Pleasure and displeasure as contents of consciousness are not more opposed than warm and cold. The series of temperature sensations which lie between these two end points also leads through an indifference point.

Even the volitions, considered as mental phenomena, are simply existing facts of which we become conscious, but which do not point beyond themselves and therefore cannot point to any opposite volition. Wishing and declining are two mental states which simply exist and play a certain rôle in the chain of psychophysical events but are in themselves not antithetic. We saw that the causal psychologist is nevertheless able to introduce an element of opposition into his account of the feelings and will acts. He links

them with the motor processes of the brain which may be antagonistic to each other, inasmuch as the impulse to one action inhibits and prevents the impulse to certain other actions. But even that surely is not a real inner contrast. It is nothing but an interference of results.

On the other side we cannot imagine a purposive act the meaning of which is not *a negation of an opposite purpose*. As a mental phenomenon our dislike is as complete in itself as the color blue or green: as an act our dislike is the protest against the liking. It refuses the liking and rejects it, as the liking repudiates the disliking. If we affirm a judgment, we object to its denial, and if in a negative judgment we refuse the acknowledgment of its content, by that we turn against the affirmation. Our love shuts off our hate, and our hate banishes our love.

There may be complex states in which hate and love toward the same person are combined, but then one aspect is loved and another is hated. In the same way we may find ourselves in a complex subtle state in which we will an end and yet do not will it. But here, too, our will and our opposition do not really refer to the same goal. As far as the same end is concerned, we may fluctuate between willing and not willing it, but in the act in which we will it we intentionally object to the not willing and vice versa. The inner antagonistic relation to an opposite is the one fundamental trait which characterizes every particle of the material of purposive psychology.

The Affirmation of Sameness.—We may further characterize the act as the establishing of a relation of sameness between two objects of experience. The connection which the act creates is accordingly not a relation between the self and his object. The self does not exist outside of the act itself. In acting, in establishing the relation between two objects, we know our self. The acting is the self, and the self posits its reality in the act. If the relation were one between the self and the object, the self

would be falsified into an object like a substance which has the same kind of existence which a thing has. The self consists of the acts, and the acts are the setting of a relation of sameness between two objects.

Let us think of the simplest case, the perception. But let us exclude entirely every reminiscence of physiological psychology. If we speak the language of immediate experience, a perception is the act by which we establish a relation of sameness between an object given to us as individuals and an object which is independent of any particular individual, which means that it is a part of the real physical world. The act of perception stands in contrast, for instance, to an act of imagination in which our individual object is not related to an independent physical world, but where an entirely different relation of sameness is established for it, the relation to a world of satisfaction. Every act of perception is *a belief* which would be meaningless without this possible relation of our personal object to an object which lies beyond us, the overpersonal, real thing.

In the act of memory we create such a relation of sameness between the object before us and the real object of the past. In our conceptions as a first step we establish such an equation between words and essential elements of the perceived or remembered or imagined realities. In our formulated judgments we posit such a relation between words and relations of objects. In our desires and volitions we demand the sameness of an anticipated end and its realization. In our feeling of pleasure or displeasure the present object is related to its continuation or discontinuation. In our attention the object of one act is held to be the identical object of the next act. And in every one of these cases the real meaning of the act is that we insist on this relation of sameness. We grasp an act of the soul by imitating internally the affirmation or denial of this relation of identity.

We have spoken here of objects between which the acts establish relations. But this again must not be construed as if those objects were the mental contents of the causal psychologist and of the physicist. The objects which the psychological or the physical scientist knows are simply objects of awareness, entirely detached from any subjective will act, independent of subjective attitude. The objectivity of their existence lies in their freedom from the will of the subject. But the objects of which we speak in the system of purposive psychology are those which we know from our immediate life experience in which nothing can be detached from our will, because we are never merely passive spectators, but are always active and attentive and selective. The objects in our real world are our means and our goals. We have to do here only with liked and disliked, with fit and unfit objects; we select them or we reject them, we attend to them or we disregard them, we leave them unchanged, or we transform them, but we are never simply aware of them.

Moreover these objects are never in ourselves. We traced the process by which the causal psychologist must treat the individual objects as if they were contained in the individual himself. Those ideas are packed into the mind to be contents of man's individual consciousness, because in the causal world the whole psychophysical organism is the individual which is contrasted with the world. For purposive psychology this would be meaningless. The self is never anything but this act of affirming the relations. All the objects between which the relations are established are only material for the self, but can never be contained in it. To ask where those individual objects to which the self refers exist is an illogical question, because we have recognized that the relation between the purposive self and its objects is not one which refers to space. It is a question of meaning and purpose only, and every question as to the where or the when or the why in the causal sense is a concession to the interests in natural science. A true purposive psychology moves in a dimension in which such a naturalistic question is meaningless.

From a purposive point of view the objects are never a part of the mental life. They are merely the material to which the mental life refers. As soon as the objects are inclosed in the

purposive system the standpoint of the empirical subject is left and that of the absolute subject is substituted. The subject who has the objects of its purposes in itself is a world soul, but no longer an individual man. Psychology speaks of the life of the individual. The objects which are its means and aims, the things and the symbols to be used are not in the subject but are only used or rejected. The acts which affirm and deny the relations are the only contents of selfhood.

Each act establishes an equation between two objects. The two sides of the equation are expressed in different contents, but as a mathematical equation expresses the sameness of the two sides in quantities, the act of the soul establishes the sameness of two objects in vital concerns. If I remember a landscape, the idea of the landscape of which the causal psychologist makes so much does not exist as a content of the purposive soul at all. I do not remember a landscape in myself. My act takes hold of that landscape, and the real function of my soul is the belief that the landscape as I grasp it is identical with the landscape through which I traveled in my childhood days. If I form a judgment, the content judged upon is not in myself. My act is the affirmation of the judgment by which I posit the sameness of the situation as I grasp it and the objective world which demands my action. Wherever the soul is at work it claims that one content is the same or is not the same as another.

This actual proceeding from one to the other is what gives to the acts of the soul their purposive character and at the same time the reference to an opposite. From the standpoint of objective observation those contents alone can be found, and that real act disappears, because it can never be an object. If we look into a photographic camera we see the scenery projected on the ground glass, and everything lies side by side in the flat picture. But if a light point outside in the world moved toward our camera or away from it, we should be unable to see the change

of distance on our ground glass. It can picture for us only that which is spread from left to right, but it cannot give us that other dimension in which something may move from a near to a distant point. The causal psychologist describes to us all which can be found on the ground glass: the purposive psychologist is interested only in that which moves in the other dimension toward the real objects of life.

In causal psychology we found a formula which covers all volition processes. We saw that every time the perception of the end is anticipated by the idea of the end. In other words, the causal psychologist also characterizes the intentional processes by a certain sameness of two contents. But as he lacks the possibility of characterizing that inner relation, he cannot do otherwise than to describe them as two successive contents of consciousness externally connected by sensations of bodily movements. The purposive psychologist reestablishes the inner relation. The will is the energy to make the two one. Here the idea does not precede its realization, but it points to it. Their sameness is affirmed: that alone is the act of the soul, and no act of the soul is anything but such a will activity which insists on the sameness of two contents or denies it.

CHAPTER XXIV

CREATION

Analysis of Purposes.—The first step in purposive psychology is to analyze the tissue of purposive life into its elementary acts. We cannot emphasize too much that while the theory sounds abstract and very remote from reality to those to whom the natural sciences alone unveil reality, these purposive acts are the most familiar experiences which we know. We must always begin with such an analysis where we want to understand an individual. To be sure, the work of the causal and of the purposive psychologist may move along parallel for a time. Both the efforts to describe and to understand demand a resolving of the complex. But as soon as the first chief distinctions of characteristic emotions and volitions and thoughts are secured the two must go entirely different ways.

If the economist analyzes a captain of industry, he speaks essentially in purposive terms when he traces his love of comfort, his desire for distinction, his impulse to activity, his passion for power and mastery, and so on. Every one of these desires can be understood as an act which has a meaning, and can also be considered as a psychophysical setting. But if the analysis is carried further it will lead to entirely different elements in the two directions. The causal psychologist would analyze that desire for comfort into images composed of reproduced sensations, into kinesthetic sensations, into feeling sensations, into facilitations of certain associations and their

psychophysical processes. The purposive psychologist would analyze the desire for comfort into desires for a beautiful house and luxuries, for travel and recreation. In short, the one would seek atomistic contents of consciousness and the other simpler and simpler purposive acts.

But this splitting of the personality into smaller and smaller groups of independent purposive acts is not sufficient for the understanding of the inner life. The experiences of the personality are not a mere sum of detached acts; but *the deepest meaning of the individual lies in those acts which bind two other acts together and thus establish a relation not between the objects of the soul, but between its own functions.* The one act is affirmed to mean the same which the other means, and this affirmation is a new act establishing sameness. In the analysis to which we just referred the desire for comfort and the desire for activity may be considered as two independent purposive functions. But when we divided the first, the desire for an ample house is not independent of the desire for comfort, but is partially identical with it. Willing the one involves willing the other. In the same way the longing for activity and for comfort are both involved in the desire for economic success.

In our intellectual experiences we establish such a purposive connection between our acts of judgment. It makes no difference whether our thought proceeds from the judgments concerning single facts to general statements or from general statements to particular judgments. Each judgment and each statement is an act of acceptance and belief in reality, and our experience in thinking is the affirmation of the sameness of these various acts. The scientist and the philosopher alike bind their acts together by establishing identities between their various doings.

The whole experience of our *selfconsciousness* in the field of purposive psychology is exactly this ability to posit the identity of various acts of ours. We feel the unity of

our self not as something which lies outside of the acts, but in the interrelation of the acts. The act which affirms the sameness of two other acts binds these together and at the same time establishes the unity of the self. Every development of thoughts or volitions contains, therefore, the purposive knowledge of our self. The selfconsciousness is thus clearly to be distinguished from the idea of the soul. We know ourselves in the actual affirmation of the sameness or the non-sameness of several acts of ours. But we do not know our soul. We postulated a soul as a system of potential acts which become realized in the concrete acts of the individual. But this soul was a construction for theoretical purposes. The psychologist, not the self, demanded it. It is needed in order to understand the arising of the particular acts, but it was not found in the individual experience. It guarantees to the purposive subject himself continuity in the stream of personal experience.

The Freedom of the Will.—The purposive connection of the acts of the soul not only binds the inner experiences, but makes them agents of free creation. Creation and freedom, indeed, belong together. A mere mental mechanism cannot be free and cannot create anything, but can only produce certain effects. Let us first trace the problem of freedom. We have touched it in causal psychology, but only the contrast with purposive psychology sets it right. We speak of freedom in the midst of a causal system of psychology, too. What does it mean there? It certainly cannot mean an exemption from causality. Every process of thought or will must be completely explainable from its causes. The scientist claims that not because he sees himself so near to the fulfillment of this demand, but because it is the proposition with which he starts.

Yet he is not obliged entirely to dispense with the conception of freedom on the basis of his causal system. He calls those acts free which result from the normal coöperation of all parts of the psychophysical system. If this

system is disturbed and part of the mechanism out of order, the individual has lost his freedom of decision. The insane, the drunken, the hypnotized man is not free. The discrimination is not based on the fact that an action is produced by the actor himself. The insane man also acts from his own motives, and the drunken man, too. Yet they lack freedom because in the one case some brain cells may be overexcited and produce an irresistible impulse, and in the other case brain parts may be paralyzed and inefficient in producing the normal inhibition. Under such conditions the individual is not responsible, because the action is not really the product of his whole mind brain system, in which the earlier experiences are still influential. The freedom of an action, accordingly, is the absence of interference in the interplay of the psychophysical apparatus.

This conception has its significant practical importance, but it certainly has no reference to that freedom which gives meaning and value to our true purposive life. If we feel ourselves as free actors in our thoughts and decisions, in our feelings and beliefs, we certainly do not understand by this that the inner action is a necessary outcome of undisturbed brain processes. As soon as our decision is artificially forced into the time-space-causality scheme, the question can be only which causal connections constitute the free action. But if we take life as we live it, *the free act is free because it has no causes*. Only this carries with it the real meaning of *responsibility*.

The judge can easily treat the criminal as a psychophysical mechanism, and yet feel justified in punishing him. He will be put into jail for his assault, first because the punishment will be perceived by others and may have an inhibitory influence on the criminal impulses of other degenerates. Secondly, he may be punished because his suffering from the punishment may establish associations by which he himself will shrink from a new violation of

law in future. Thirdly, he may be trained to useful behavior in jail. And, lastly, he will be separated by the prison walls from possible victims. These causal arguments justify a punishment; and yet if the thought which lies at the bottom is followed further, justice, responsibility and punishment in their moral sense, have vanished. The criminal's so-called free acts are to the causal psychologist necessary products of the inborn disposition of the nervous system and of the totality of influences from the surroundings. The nervous system determines the particular reaction. The violation of the law was the product of the individual, but the individual was the product of his ancestors and of the surrounding community. The misdeed was thus no different from a mental disturbance, and the prisons are nothing but asylums. A society which accepted this view consistently would give up the idea of justice and responsibility, together with the idea of non-causal freedom.

The purposive psychologist alone can remain entirely loyal to man's immediate conviction that his act is complete in itself and does not refer back to causes which determine it. To raise the question of causes would shift the center of interest or would be meaningless as long as the interest remains the desire to understand the purpose of the act. *Every act is to the outsider an appeal to grasp its meaning, and to the experiencing subject a decision to remain loyal to this meaning.* It is an appeal and it is an approval; and neither approvals nor appeals can be enriched by an effort to link them with causes. It is, therefore, entirely misleading when popular philosophers not seldom claim freedom for the purposive deeds of the mind with the argument that the causes are too complex to be traced or too subtle to be discovered. That would be a freedom which is based on ignorance or laziness, and which would be shaken by every new scientific discovery of the working causes. A wave of the ocean is

just as much determined by causes as the rippling of the pond into which we throw a stone. The mere complexity of the causes and our inability to trace the detailed causes of the midocean wave make no difference. The real acts of the human soul do not have obscure causes, but they have no causes at all, because they consist only of a reality which is completely understood when its meaning is grasped.

The act as such, therefore, has no effects either. The external results of our free actions are first of all bodily expressions and only those expressions become physical causes of physical effects. My will to open the book does not open the book. It is my finger movement which opens the book, and this finger movement is not the effect, but the expression of my will. I may have an interest in considering that finger movement as a part of the physical processes in the world, and in that case I can trace it back in the causal series and can find that my finger movement which turns the cover of the book was caused by a process in the cortex of the brain, and I may then correlate my will as a process to this cortex excitation. But then I have taken an entirely different starting point and have given up the interest in the will as a meaning. As long as the will is a meaning to me, its bodily expression is a meaning, too, and from the standpoint of this purposive will even the opening of the book is not a mechanical effect of the muscle contraction, but the aim of the act.

The Creative Power.—While the act as a purposive meaning cannot have effects, it has and must have inner consequences. Whatever decision enters our soul joins many others and their relations themselves become the contents of new acts. *The resulting total act is therefore far more than the mere sum of the single acts.* It is something entirely new: it is a creation. Our whole inner life is creating richer and richer acts unceasingly. In the causal universe not only in the physical but also in the psycho-

physical system the law of the conservation of energy is paramount: in the purposive world of our soul the meaning grows like an avalanche. From a few propositions, we may deduce a theory of widest compass; from a feeling-tone we may develop a beautiful work of literature; from one vital practical decision we may reach the decision for a thousand details; from one act of perception we may come to grasp the reality of a most complex situation. In every one of such unlike practical cases the possibility for all the accessory acts must have been potentially in our soul. The feeling-tone in itself did not contain the drama in which it unfurls itself. The ideas, the memories, the knowledge, the interests, which are exhibited in the scenes of the drama must have been a possession of the soul, but the meaning of that one intense feeling brought them together into a perfectly new reality.

Our whole life is such a continuous creation. In our life-reality we know no more of the soul which the purposive psychologist demands than of the brain to which the causal psychologist refers. The genuine experience is this free creation itself which in every sphere of interests reaches higher and higher acts. Modern philosophy, since the days of Fichte and Schopenhauer, has never lost sight of this fundamental fact that the true reality of our life lies in our free creative will and that the thought-forms in which this world of will appears as a causal universe are the creative evolution of the will itself. In our generation this thought of idealism has found many a scintillating expression; and everywhere this creed of the free creative subject is in the ascendancy. It does not contradict the zigzag tendencies of naturalism, pragmatism, realism or neo-realism, which appeal and always have appealed to various onesided interests of man. They all express partial truths, and as such they are included in and affirmed by idealistic philosophy. Man's free creative will is the rockbed of reality.

The doctrine of man's freedom not only leaves room for many fragmentary philosophical views of knowledge, but also for a naturalistic psychology. The scientific truth of a causal study of mind is nowhere interfered with by the recognition of the free purposive act as the condition of every thought. This is indeed the one great conquest of our own time as against the idealistic philosophy of a hundred years ago. The thinkers of that time recognized the dependence of causal physics upon the creative action of the soul. They saw that the world as nature was dependent upon forms which were needed for the purposes of the free subjects, but nature to them meant only the physical world. Since that time the natural science of psychology has grown up. Through a century of physiological psychology we have learned to master the mind as a causal system. It was the task of the idealistic philosophy of our day to recognize that mind seen as nature, like the physical world, stands under thought forms which are dependent upon purposive acts. This involved the new demand of idealism, foreign to philosophical thought before the last two decades, that two distinct accounts of inner life be recognized, causal and purposive. The naturalistic, causal view of mental life is true, but its truth is a construction needed by the purposive mind in its creative unfolding. But the full vista of this truth-creating act opens only when the purposive mind is not considered in its isolation, but in its internal relation to other individuals.

PART III. THE SOCIAL EXPERIENCES

CHAPTER XXV

PRACTICAL RELATIONS

Understanding.—The elementary social relation between soul and soul is the act of understanding. We know that our interest here is not concerned with the causal problem of the transmission from one man to another. To the purposive psychologist it makes no difference whether one speaks and the other hears, or one writes and the other reads, one cables and the other receives the cablegram, one writes five centuries before Christ and the other reads twenty-five centuries later. The real act of understanding consists of two elements. We perform the same act which another performed, experiencing its full meaning; and yet at the same time we refer this act of ourselves to the self of the other. The soul of another man is to us an interrelated system of such acts of meaning which we understand, but which we grasp as acts not our own.

To be sure, in understanding our neighbor's acts we must think of the world from the point of view of his body. The place and time of his organism with its sense organs and its muscles determine the selection of things toward which he takes his attitude. But these attitudes in their genuine purposiveness constitute the personality which we try to understand. In absorbing those acts, in sharing their meaning, we nowhere leave the strictly purposive system: the other men do not become objects to us, and their functions are neither causes nor effects. The

objects remain to them as to us the material for attitude. They are things to be used or to be rejected, real only as material for the purposive subject. The world which consists of our fellowmen is not a fragment of the outer world; it is an independent, genuine world which we understand in performing our purposive acts of emotional, intellectual and practical apprehension. We understand the pain and joy, the remembrance and thought, the plan and decision and deed of our fellowman.

The inner experience becomes much more complex, if a new act of ours builds a new purposive superstructure and affirms or denies a relation of sameness between our own attitude and that attitude of ours which we refer to the other man. Then we come to the act of *sympathy* or lack of sympathy with his feelings, of *agreement* or disagreement with his thoughts, of *willingness* or unwillingness to accept his decisions. From this starting point the purposive psychologist has to trace all the complex emotional organizations of acts which refer to acts which are themselves related to acts. Gratitude and envy, friendship and hatred, pity and fear, desire for social honor and condescension, trust and distrust, love and disgust, are such systems of acts, which can be understood only if it is acknowledged that every act points beyond itself and that every meaning binds one experience to another. They can be grasped only by disentangling the subtle acts which enter with their reference to acts in the world of fellow-beings. Nothing whatever can be gained for this true understanding by any explanation. They have meaning, not causes.

Interpretation.—Another large group of purposive structures which grows from the simple understanding of the fellow-being comprises the acts of interpretation. Their aim is to develop the meanings which are involved in the purposive acts of another. The feeling of the crying child is easily understood. The expression of the child's

thought may need some interpretation, as we may misunderstand his true motives and purposes. The thought of the politician may need much more complex interpretation, as his words may not directly suggest everything which is in his mind. The interpretation of a poem may bring to our mind feeling acts of the poet which he has not expressed by the meaning of the words, but by the choice of the sounds, by the rhythm, by the rhyme. But the interpretation may entirely abstract from the acts of the individual who expressed himself and may unfold the meaning of the expression with reference to any subject who apprehends the act. The lawyer interprets a law without necessarily grasping those intentions which the originator of the law had in mind, and the philologist interprets a work of literature without necessary reference to the writer's own purposes. A scientific theory stands before the world and demands interpretation quite independent of the aims of the thinker who created it. Finally, every step in the interpretation of acts of others may lead to the grasping of intentions which allow new acts of agreement or disagreement, of approval or disapproval, of sympathy or antipathy.

Social Intercourse.—The psychology of understanding and of agreement or disagreement is the psychology of the elementary social experiences. Their combinations and developments lead to the manifoldness of practical intercourse, of coöperation and antagonism in every field of human interest. The submission and aggression, the subordination and superordination, the organization and division of activity can be traced, just as in causal social psychology; and yet everything has here an entirely different significance. No physiological changes and no reactions and no mental processes as effects of such influences are any longer in question. Will reaches out to will, purpose joins purpose, subjects help and hinder subjects.

Of course practical life may create situations where the

submission of another man or his aggressiveness cannot be understood as an expression of his soul. We do not grasp it by entering into its meaning. We therefore seek its causes and we may find them in a disturbance of his brain which stirs up the aggressive emotion or in the hypnotic state which causes the submission. But in such a case we have really left the purposive world. The other individual is no longer a subject to us, and has become an object. The act of the insane person does not appeal to our understanding, but to our effort to treat the patient and accordingly to explain the abnormal process. The conceptions of purposive psychology cannot have value beyond the world in which the meaning of subjects is expressed. The buyer and seller in the market, the teacher and pupil in school, the judge and criminal in court, the employer and workman in the factory stand fundamentally in this subject to subject relation. It is theoretically possible to give a full account of all mental acts involved in their dealings without leaving the path of interpretation.

The total report of the business transaction or of a classroom hour, of a legal trial or of a technical discussion, of a political gathering or of a religious ceremony, can be much more accurately given in these terms of understanding and agreement than in any descriptions of causal psychology. This description, if it were carried out with ideal perfection, would also leave no particle of the transactions unaccounted for. The millions of psychophysical processes would finally cover every subtle thought and feeling. But the decisive difference would be that in this causal description the processes would be analyzed into elements which were never experienced as such, and that the divisions and the combinations would be controlled by explanatory interests entirely foreign to the experiencing subjects of those practical events. The purposive psychologist might need just as many elements in tracing the subtlest meaning and intention in all the acts which are

held together in the participating souls. But his whole analysis would remain in immediate contact with life itself. He would resolve the complex intention into partial intentions which were really felt by the subject, however little they may have come to isolated apprehension. His analysis would move in the dimension of life and his combinations would be controlled by comprehensive acts of the subjects themselves.

This is the reason why the historian must speak the language of purposive psychology, if he grasps the true humanistic meaning of historic life. It is certainly interesting to bring the development of mankind, from savage life to the highest differentiation of to-day, into the thought forms of natural science and to explain the actions of the leaders and of the masses from a biological point of view. But however subtle the dissections of the causal psychologist may be, the spark of the historic spirit is extinguished. The life of history, political as well as cultural, must be understood as the purposive influence of souls on one another. The mere fact that events have occurred does not raise them into the realm of history. We may speak of the history of the stellar system or of the earth or of the plant life on its surface, but in a deeper sense they have no history, as long as we do not interpret them by a bold philosophy of nature as the unfolding of a world of meaning. The physical objects are in the eyes of the true historian only the means of help and of resistance to the purposes of the subjects. Even where natural events intrude into the historical interplay, the real historic significance lies in the change of attitude of the subjects. In short, they, too, must be understood with reference to their importance for a world of meaning. The whole economic, political and cultural stream of civilization flows through the realm of purposive reality.

We have emphasized the purposive significance of all which is an external expression of meaning. The bodily

movement, the gesture, the spoken, the written, the printed word are not physical things or physical processes, but are appeals for the understanding of their meaning. In a true historic spirit this interpretation must be carried further. Then the work of our minds, the tool, the instrument, the machine are bearers of meaning, too, and so are the fruit which we harvest and the house which we build. This reaches its widest importance when we expand the view to the historic institutions which hand down the traditions of mankind. The purposive meaning of millions is condensed in school, and church, and court. The will of communities lives embodied in the flag and the hymn and in any symbol of historic import.

CHAPTER XXVI

IDEAL RELATIONS

The Ideal Purposes.—The account of our purposive life is not yet completed. The soul creates its free acts as a response to the outer world and to the social world. It unfolds through them its own meaning. Whether man masters the things and makes them realize his individual purposes or whether he agrees or disagrees with, submits to or attacks the purposes of others, it is his personal life energy which binds his acts together. The one fundamental will act of asserting himself enlivens every response of his soul. He seeks his pleasures, he escapes his dangers, he loves his friends, he fights his foes, he strives to learn and to grow: the life tendency of his personality is not only a will to exist and to enjoy, but to advance and to gain in influence. The "will to power" has often been proclaimed as the formula of the individual life. The individual temperament decides whether it will realize itself in contact with others more by aggressive forms like ambition, courage, curiosity, stubbornness, or by the protective forms like anxiety, modesty, submission, greediness. Every inner movement is somehow directed toward selfaggrandisement or selfprotection. Whatever fulfills this demand for selfassertion gives satisfaction and is felt to be valuable. The values which one seeks may agree with the values of another. But his satisfaction depends upon his personal interest.

The values which satisfy our personal life desires are, however, not the only values which we acknowledge.

Everybody knows satisfactions which are not related to the individual needs, fulfillments of demands which have no selfish origin. We experience purposive acts which we do not feel as our individual acts; and yet which we do not refer to other particular individuals. They are not related to this or that neighbor, to this or that leader; they are not understood as expressing the desire of any other particular individual. *We understand them as belonging to every subject whom we are to acknowledge as a subject at all.* They are our acts, but they do not express our individuality: they express our being subjects.

Only in so far as we share these purposes do we become parts of the interpersonal community of mutual understanding and mutual acknowledgment, a community with a common world. If we do not want to enter into this community with a common world, if we want to consider our life only as a dream, not acknowledging the reality of others or of a world, then we are not bound to share these fundamental acts. But if we want to have a world in common with others and if we want to understand others, and if we want to be understood in our subjectivity, then we must affirm those acts which build up a world common to all. The fulfillment of these demands for a common world must then furnish a satisfaction which lies beyond the mere selfish pleasure and enjoyment. Its values are not simply personal, but overpersonal, absolute, eternal values. They take *the fourfold form of truth, beauty, morality and religion.*

The Normative Acts.—The acts which demand these logical, esthetic, ethical and metaphysical values are our acts, like those which demand the personal values of safety and pleasure and power. Yet they spring from a deeper source. They serve ideal purposes. It depends upon our performing them whether we are true subjects at all. We feel those purposive acts, therefore, as superior to our individual acts. We call them *norms*. We are not free to

will or not to will them; we are obliged to will them, if we will to be parts of the common interpersonal world. *We acknowledge them as obligations and measure our individual acts by these overindividual standards.* Just as the objects which are common to all, the physical things, form the true world as against the dreams and imaginations and hallucinations of individuals, so the values which must be common to all form the true world of satisfaction as against the haphazard pleasures of the individual man.

If I meet a man, it may be my will to ask him for advice, or to buy something of him, or to enjoy his conversation: all this is strictly personal. I will it without the least expectation that some one else may will the same. But if I see a man whom I do not know in mortal danger, my will aims to help him. The purpose of my will is now the saving of his life. It is my own will, and yet this time I do not will it for my personal ends. It is a will in me the aim of which has no reference to my personality, but to something which is of common value to everyone, the respect for human life. If I will to help and not to kill, to protect and not to steal, to speak the truth and not to lie, the purpose may be in conflict with my personal desires; and yet my will toward the painful sacrifice is stronger.

But it is no different in the intellectual field. I seek the truth, and I affirm the true judgment. I say two times three is six, and I reject every different proposition. If some one suggests that two times three may be seven, I do not will it: it does not fulfill my purpose. Yet I will the true judgment not for my personal benefit, but because it is valuable in itself. I mean by truth nothing but such judgments which I will with the claim that every person must will them with me regardless of personal pleasure. The ancient Sophists tried to make the crowd believe that there is no truth which is valuable for all and that any individual may call truth whatever fits his or his neigh-

bor's personal purposes. But Socrates showed for all time the inner contradictions of such "pragmatism." Whatever the Sophists pretend, they themselves want to give us a truth, and that means something that everyone who thinks at all has to accept as valuable. Hence they themselves claim that some real truth exists which has more than merely personal meaning. Of course the possibility that a personal pleasure may be added to the real value of the truth is not excluded. I may have personal advantage from knowing certain facts, but the pleasure derived from my personal gain involved in the knowledge does not make my satisfaction in the truth as such.

We have exactly the same case in the world of art and beauty. To be sure, we may have a personal pleasure in seeing a painting or hearing a symphony or reading a drama. Yet no one has understood the meaning and mission of art who does not feel that the personal enjoyment does not constitute the true value of the artistic creation. We may just as well derive pleasure from dancing and feasting, from fighting and sleeping; but the enjoyment of the tragedy and the symphony is upheld by the conviction that we are in contact with something that is more than our chance pleasure, something that must be valuable to everyone who understands the beauty of the world. Hence the purposive psychologist finds in every sphere of human life two different kinds of activity in the individual soul, personal acts and normative acts; and no account of inner life is complete which does not include the latter too. Yet, to analyze them would lead us beyond psychology; this is the task of the philosopher.



BOOK III. APPLIED PSYCHOLOGY

PART I. PRINCIPLES OF APPLIED PSYCHOLOGY

CHAPTER XXVII

THE AIM OF PRACTICAL PSYCHOLOGY

The Present Situation of Practical Psychology.—We take a narrow view of scientific knowledge if we claim that it has a right to exist only when it can serve our practical interests and can be applied to the tasks of life. Truth must be respected as valuable in itself. Like beauty, it fulfills an ideal demand, and we ought to devote ourselves to the discovery of truth without asking how far the truth can be used to bake our daily bread. But our view is certainly no less narrow, if we take the opposite stand and are indifferent to the practical usefulness of our scientific results. The admirable eagerness to contribute to and to spread theoretical knowledge has often led to a certain unwillingness to link theoretical psychology with the practical needs of the community. Some have the feeling that psychology loses its dignity when it becomes a handmaid of routine life.

This feeling can be the more easily understood as every community is swarming with pseudo-psychologists who, in a dilettantic manner, apply a self-made popular psychology to the ills of society. There always were quacks, of all shades of sincerity, who tried to cure diseases by mental influences without any understanding of the laws of the mind. The scientists naturally shrunk from contact with the charlatan and the sensation seeker. The popular mind

also often coupled the legal court procedure with psychological processes. But the interest did not turn to the scientific psychological examination of witnesses or the psychological analysis of the criminal: it was essentially gossip about hypnotism and similar objects of popular curiosity. The psychologist and the lawyer alike preferred to avoid everything which reënforced such fantasies. Even where psychology and education came in contact, the efforts were too often a product of superficiality. Half understood psychological principles were misused by the public for the promotion of educational fads and the strengthening of educational prejudices. The wise educator and the psychologist alike felt unwilling to submit to such a clamor. This widespread unscientific psychology in many such fields of practical life has certainly hindered the progress of real applied psychology, and this difficulty is still by no means overcome.

Yet while it is easy to find reasons for a certain reluctance in the past, there ought to be no doubt that such detachment from life is no longer excusable for the psychology of to-day. Nobody imagines that physics and chemistry are desecrated by being harnessed for the technical achievements of society. We could not imagine the laws of electricity or of steam power being known in the laboratories and not being applied for railways and steamers, for lighting our houses and for cabling our news. It is no less fitting and natural that the progress of psychology, too, should become helpful to the community wherever mental life is involved in its affairs, and it is evident that the mind takes a characteristic part in every domain of social interest, of education and of religion, of politics and of law, of commerce and of industry, of art and of scholarship, of family life and of practical intercourse, of public movements and of social reform.

To be sure, the history of mankind shows that the greatest technical triumphs were always won through the

work of scientists who did not think of the practical achievements but exclusively of theoretical truth. The work of the engineer has always followed where the physical truth seeker has blazed the path. It cannot be otherwise with applied psychology. The results of psychological technic must remain superficial without a solid foundation of theoretical psychology, and this must be laid without any side-thought of practical usefulness. But as soon as such psychological knowledge is really secured, we have simply no right to disregard it, when the needs of society are so evident.

But it may be added that *the development of psychology itself favors this new trend toward applied psychology*. One characteristic change in the recent interests of the psychologists proved of especial significance: the long disregard for individual differences in experimental psychology has ceased. When psychology emancipated itself from philosophy, the fundamental aim was to study the mental facts in the same way in which the naturalist studies the physical facts. The general emphasis, therefore, was laid on the search for general laws. The mental curiosities and surprising happenings in individual cases had too long held the interest of the psychologists of previous times. The new psychology was to get rid of this anecdotal kind of unscientific observation. The result was an instinctive suppression of all the facts which characterize the individual differences of man and an overemphasis on the common laws of the mind.

Yet it is evident that this condition works directly against the practical application of psychology. The physician, the lawyer, the educator, the minister or the business man who neglects the individual differences of the patients, witnesses, pupils, parishioners, or customers, loses his chief opportunity to touch the levers of the mind. The abstract mind, common to all, is a fiction which is necessary for the development of theoretical psychology,

but utterly unfit for practical achievement. Since the beginning of the new century the interest of psychologists has shifted more and more from these general laws to the study of those factors which determine the individual variations. The personal characteristics which at the beginning of experimental psychology were treated more or less as a disturbance which only obscured the general laws are now the material for most careful examination. This new turn in the scientific theoretic interest most naturally brings a turn in the practical attitude.

Moreover, the work of the psychologist has reached today a high degree of consolidation. The best interests of a young science demand that a certain stage of development be reached before the results are carried to the marketplace. It is dangerous for the scientist, if he is disturbed in the quiet elaboration of his theories by impatient demands of the outer world. A few decades of seclusion behind laboratory doors was most desirable for experimental psychology. This first period, however, may be acknowledged to be closed. The work is at a stage at which the exchange between theory and practice may be helpful and stimulating in both directions.

Misgivings may be eliminated the more readily, as fortunately a *division of labor* has begun. The interest of the men of affairs, of the teachers, physicians, lawyers, social reformers, in the working of the mind has been awakened and demands satisfaction. If such inquiries push their way into the midst of the theoretical science, they do indeed threaten the circles of theoretical research. As soon as the problems of applied psychology become an independent field of investigation, this disturbing tension in the midst of psychology will be relieved. The physiologists and pathologists would have to suffer too, if medicine were not an independent science. The scientific problems of technical industry, of agriculture, of engineering, of navigation, cannot be ignored; and yet they would not be

shifted to chemistry, physics, botany and astronomy without displacing in a most dangerous way the natural center of gravity of those theoretical sciences. As soon as the labor has been divided it can develop in both fields without restriction. The practical psychologists can then really adjust their questions to their own specific interests instead of being obliged to subordinate them to conceptions of general psychology and to make them a mere appendix of theoretical studies.

The educator knows very well what a large rôle attention and memory and thought play in the classroom, but he is little aided if he simply takes the results of the laboratory studies in these topics and translates them into pedagogical schemes. What is needed is psychological research directed toward those problems which school life presents, just as the engineer does not simply use the results of the theoretical physicist, but bases his practical work on technological studies which are from the start adjusted to the engineering problems. The lawyer, too, cannot profit much from simply consulting general physiological psychology when he is interested in the memory or suggestibility or emotion of the witness. He must be able to fall back on psychological investigations which are concerned with the mental problems of the court. The situation is the same for the physician, for the manufacturer, for the reformer. This division of labor has just begun. Direct experimental research in educational psychology, legal psychology, medical psychology, industrial psychology, and so on, has been started, and investigations on practical problems fill the modern psychological laboratory side by side with strictly theoretical research.

The right of the scientific psychologist to link his results with the technical needs of social life is founded on even deeper reasons than that of the physicist. We need only to remember our earlier discussions on the principles of causal psychology.

We saw that the inner life of those around us does not present itself as a system of causes and effects but only as a meaning to be interpreted. To study it as cause and effect involved a reconstruction, and every causal statement was thus an answer to an artificial question. But why should we raise such an unnatural question at all, if there is no need of applying the results of causal psychology to important practical interests? If we were concerned with theoretical insight only, we ought to be satisfied with a mere understanding of man, that is, with purposive psychology. The whole elaboration of causal psychology, and that is after all the form of psychology which is traditionally accepted as the science of the mind, has significance only if it is ultimately to serve our practical ends.

This is clear: If we are to change the world, to reform and to improve men, to teach them or to cure them, to make them perform efficient labor or to organize them for common action, then we must treat man as a system of causes which will produce certain effects. We must be able to foresee what will happen and to determine how we can mold the mind. In short, if we want to treat man as a means for the realization of our practical ends, we must have causal psychology. Through the practical application alone the unnatural problems of causal psychology become justified. The technical use of psychology gives real meaning to the whole great movement devoted to the causal study of the mind. If this end did not exist, causal psychology would be a scholastic attempt to solve an unnatural problem.

The Limitations of Applied Psychology.—The time has come for the acknowledgment of applied psychology as an important and valuable science, and the day is probably near when it will be taught as such in every high institution of learning and when it will finally control its own laboratory workshops. But this conviction and this hope must not lead to any overestimation of the present achievements. A science which takes its first steps cannot be expected to lead us a long way. Whole chapters of a possible applied psychology are still essentially blanks.

They will be filled the more easily the more the new science develops its independent methods. As long as the practical applications are only by-products of the theoretical science the progress must be accidental, but as soon as the scientific work is immediately directed to the practical problems we may hope for a steady growth of the available information.

But a warning seems no less relevant with regard to the practical application itself. We are always in danger of drawing wrong practical consequences from right psychological facts. This results from the complexity of the practical conditions. Every special case represents a complication of many factors and we may be drawn into a harmful misuse of our psychological knowledge, if we focus our attention on one of the psychological elements and ignore the others. Just as the physician would be misled if he treated a disease with reference to an isolated symptom, the psychologist, too, must give his attention to the whole combination of elements. Not only the incompleteness and the possible neglect of influential factors suggests a warning, but it would also be dangerous if psychology were applied in a narrow spirit at the expense of other agencies. It must coöperate rather than dominate. Its newness and still more the quickness of its results suggest a certain superciliousness toward the older and slower methods of securing changes in the social world.

In the educational field, for instance, serious hopes are certainly justified by applied psychology. But the development of the pedagogical situation shows that these hopes have too often turned the attention away from other no less important elements of school life. The educational authorities so strongly encouraged the belief that the school methods would be improved by the teachers' study of psychology that the other forward movements in pedagogy became somewhat neglected. There can be no doubt, however, that no psychology and no insight into the methods

of dealing with pupils can be a possible substitute for the first requisite, the thorough scholarship of the teacher in those subjects which he is to teach. Still greater is the harm which is threatening in the field of medicine. The application of psychology in the treatment of disease is of utmost importance, but it is inexcusable when pseudo-scientific movements turn directly against all official medicine and propose to treat every ailment by psychotherapy, eliminating drugs or surgery.

Finally *the knowledge of applied psychology must not be brought into any conflict with the natural instincts* or with the trained abilities. It would be an undesirable development if the teaching of applied psychology should interfere with the spontaneous behavior and should force on us a scientific thought attitude, where life calls for a naïve, immediate reaction. The chances are great that the psychologist may not know all the factors involved and that his deliberate analysis of the case and his rational calculation of the necessary steps will spoil the chances of success. We walk and climb stairs without thinking of the physiological laws of muscle contraction. Of course a physiologist would be able in every case to determine which muscle activity would be the most effective to bring us upstairs, but if we should really intrust the problem to the physiologist in the particular case we should be the losers, unless exceptional conditions demanded a scientific treatment. We approach the need for the scientific aspect more closely, if we think of our eating instead of our walking. The choice of our food is usually left to our mere instinct, too. Yet it is evident that we profit greatly if scientific physiologists advise us what combinations of food are essential to keep us in good working order, and this advice becomes indispensable in the case of illness.

Thus we have a continuous transition from those spheres in which we take care of our body by relying on our natural instincts to those spheres in which the careful scientific

consideration is of highest value. In the psychological field we find the same principle of small transitional steps and the absence of all sharp lines of separation. If we simply reflect on a problem or calculate some results or picture some consequences in our imagination we are no more concerned with the auxiliary functions necessary for the processes than we are in the case of walking or running. We leave everything to the natural course of events. But if we try to recall something which has slipped from our memory or if we try to concentrate our attention or to discriminate some bodily sensations or to enhance an enjoyment, it may indeed be practical to bring our mental mechanism into motion with conscious consideration of the psychological laws. If we wish to make our perception independent of optical illusions or if we try to bring an autosuggestion to its fullest effectiveness or to learn something by heart with the least possible effort or to carry out a piece of mental work with the least possible fatigue, psychological knowledge may show us ways which mere instinct would be unable to find.

It is not true that the scientific dealing with the mental situation is always aimed toward an elimination of the naïve responses. On the contrary the reflective activity constantly prepares the way for the unreflective. We must not forget that those activities which are performed without reflection are seldom inborn instincts. The writing and piano playing at first had to be learned with much effort. We continually learn to connect movements with the help of our attention, until they are performed without reflection. In the purely psychical sphere the situation is the same. There, too, the conscious analyzing reflection leads to a mastery over the mental functions which slowly becomes natural and apparently instinctive. The physician who has carefully and painstakingly studied abnormal mental life gradually learns to react on a pathological symptom in a fitting way without any conscious analysis.

The so-called naïve instinctive response is usually nothing but an abbreviation of the conscious, acquired, attentive activity. The scientific interest is only the highest stage of this attention, which is directed to the parts of the processes; and, accordingly, there is nowhere a contradiction in principle between the naïve and the scientific attitude, either in reference to one's own mind or to the mind of the outsider. One shades over into the other; one disburdens the other and makes it free for new and ever-new tasks. The practical psychologist, therefore, has no interest in replacing or eliminating the belief in the value of the so-called instinctive psychological reactions.

But the most serious warning has not yet found words. The practical psychologist ought never to forget that his *psychological understanding can give him insight only into the means needed for a certain end, but cannot select the ends themselves*. No educational psychology can determine what pedagogical ends should be reached by the instruction. The psychologist can only point out that if we want to reach these particular ends of education, just these particular means are needed. We can understand the psychological mechanism of attention or memory or imitation and can deduce from this insight how memory or attention or imitation are to be used. But psychology cannot tell us what is worth attending and what is the ideal to be imitated and what is the most desirable memory knowledge for life. Entirely different considerations of moral and social character have to determine the goal of instruction. This repeats itself in every other field. The psychologist may show to the lawyer by what means, for instance, a confession may be secured, but whether it is right or wrong, legally admissible or legally impossible to extract a confession from the defendant without his knowledge is a question with which the psychologist may not deal and to which the psychologist, as such, has nothing to con-

tribute. He knows how to reach the goal: he has no right to judge as to the value of the goal.

This is not a shortcoming of present-day psychology which might be overcome by its progress, but it pertains to its deepest character, and it shares this necessary limitation with all the other causal sciences. The physicist, too, can only tell the civil engineer that if a building or a bridge or a railway is desirable at this place, he must use these technical means to realize the plan. But the physicist cannot possibly say from his standpoint of thought whether it is the right thing to build the railroad or the bridge or the building here and not elsewhere. Economic and social conditions have to determine that. We may say, in general, that it lies in the nature of causal sciences that they are unfit to direct us in the appreciation of our ends. Yet this is only the natural consequence of all that we recognized from the start, namely, that causal sciences represent only one special aspect of reality. We saw that our immediate life experience brings us into purposive relations which as such cannot be considered causally, but must be interpreted. In this purposive system we find the ends and aims of our activities. We choose the special purpose with reference to our more general and, finally, to our ideal purposes. In the service of our purposes we seek the realization of our aims and ends.

Life thus demands a continuous interweaving of the purposive and the causal treatment of experience. We cannot fulfill our purposes if we do not regard the causal aspect of the means by which ends can be attained. But at the same time we cannot select any purposes if we know the inner and the outer world from the causal point of view only. Our practical desires in their purposive reality and ultimately our morality and religion in life philosophy must at every moment choose our aims, while the physical and causal psychological sciences must determine the means which serve them.

CHAPTER XXVIII

THE PSYCHOHISTORICAL SCIENCES

Two Types of Application.—Our discussion of the possible application of psychology has so far been entirely one-sided. If we speak of applying a science, it may be with two quite different meanings. We can apply the results of a theoretical science in order to be helped in our practical endeavors, but we can also apply it in order to solve other theoretical problems. In this latter sense we apply mathematics in studying the problems of physics, or we apply chemistry in studying the physiological functions of the organism, or we apply the results of philology in order to reconstruct ancient history. No doubt we can also in this sense apply psychology, both individual and social, in the service of many other theoretical sciences. Wherever we have the products of man's activity in his prehistoric or historic life, in language and religion, in state and legal institutions, in literature and art, in customs and folk lore, we can make use of psychology in the study of the given facts.

Individual and social psychology give us the general laws of the mind. But besides them we can seek the application of these mental laws to the concrete historical facts. It is one thing to study the social-mental laws of panics or revolutions, and a very different thing to apply them to the explanation of a special historical crisis. In the midst of social psychology the historic facts—for instance, the development of a particular language or the growth of particular customs or special wars—can serve only as illustrations of the laws. They may be drawn into the discussion as well

as the cases of individual heroes or individual criminals or artists may be used as illustrations for the laws of individual psychology. But, on the whole, we can study individual psychology just as well if we refer to the feelings, emotions, ideas and volitions of Tom, Dick and Harry, as if we refer to Washington and Lincoln. The social psychologist can in the same way discuss the phenomena of the social mind without referring to definite historic events.

Hence the psychological analysis of real individual persons or of social movements does not find its place in theoretical psychology. If we try to explain historic life with the help of psychology we have an entirely new science. It is truly an application of psychology. The field for it is unlimited. Whatever has appeared in the history of mankind may be subjected to a psychological explanation either through individual or social psychology. We want to understand the origin of a definite work of art and seek the psychological motive of the artist. We want to understand a political deed and explain it by searching for the psychological causes in the mind of the statesman. We want to throw light on a crime and study the psychological conditions out of which it grew. But whether the philologist applies psychology to explain the growth of the Indo-Aryan languages, whether the ethnologist reduces to psychology the migrations of large tribes or whether the historian explains psychologically the political alliances or the military actions or the tariff discussions or the industrial movements of the last century, in all cases this application of psychology is an effort of explanation which refers to given facts.

It is evident that this stands in direct contrast to all those applications which we discussed before: the psychological endeavors of the teacher, the lawyer, the physician, the manufacturer, the social reformer, the minister and so on. We have the same contrast in the natural sciences. We said that the physiologist employs chemistry for the

explanation of the processes in the organism and that the physicist applies mathematics in the explanation of his physical events. How different when the technical chemist uses chemical knowledge in the interest of chemical industry in order to manufacture drugs or dyes, and when the engineer uses his mathematical knowledge in order to build bridges and tunnels. Physics and chemistry are applied here not to explain anything which is given, but to produce a certain effect, to attain a certain end which is desired. The first form was an application for theoretical purposes; the second for practical. The two usages of the word "applied" must be clearly separated and any vague confusion avoided. All the technological sciences are applied sciences in the second sense of the word. The architect and the civil engineer, the electrician and the physician, all need particular theoretical sciences to fulfill certain purposes. Their end is not an explanation, but the erection of a building or the construction of a machine or the curing of a patient.

In order to make the difference perfectly clear, we may use the term psychotechnics for that practical application which aims toward the realization of certain concrete ends as against that other applied psychology which simply explains the given historical facts. Then *the psychotechnical sciences stand in contrast to the psychohistorical sciences*. Psychotechnics is really a technical science related to causal psychology as engineering is related to physics. Psychotechnics necessarily refers to the future, while the psychohistorical sciences refer to the past. The psychotechnical endeavor may be turned in any direction in which important purposes of man are to be fulfilled. If we classify psychotechnics, we ought to divide it according to the groups of human purposes. We have a psychotechnics of education and of medicine, of law and of politics, of commerce and of industry, and so on: wherever human tasks exist in the performance of which the mind of man

plays a rôle, we have a legitimate part of psychotechnics.

Yet we may say, the psychohistorical sciences which look backward and which explain the concrete happenings in mankind are no less controlled by our practical interests. Everything which the world offers demands understanding through theory, but when it comes to an application of knowledge, we have the right to select what seems practically important and significant. From the inexhaustible mass of mental processes, we are interested only in those which are somehow linked with the development of our civilization. We have no interest in the explanation of mental happenings which had no influence on the great achievements of mankind. Just as the forward view of applied psychology in psychotechnics is confined to the regions of actual human purposes, the backward view is limited to those events which form the real history of civilization and its prehistoric preparation. The development of language and community life, of politics and law, of art and science and religion, is the central topic.

The psychologist's interests in the prospective and retrospective work are, however, not equally strong, not because the one field is more important than the other, but because *the one, the psychotechnical field, belongs fully to psychology itself, while in the psychohistorical, explanatory study of civilization, the work must necessarily be taken up by the historians.* The psychologist has no right to lay particular claim to it. It is the psychologist's share to advise the educator or the lawyer or the man of affairs how to make use of psychology for his practical purposes, but it is hardly the psychologist's right to undertake the psychological explanation of the political movements or of the development of languages or of religion or to make a psychological analysis of the great heroes and geniuses. As far as he studies the principles involved in the explanation, the results fall into the compass of individual and social psychology, but as far as these principles are applied

in order to explain the actual happenings, the historian alone is competent for the work.

It is certainly no infringement on the rights of social psychology, if we insist that the psychological analysis of the historic or prehistoric material in its concrete geographical and temporal setting is not a concern of the psychologist. For this reason it would be unbecoming to include here even the shortest review of the psycho-historical sciences as an organic part of the psychological system. It would be practically a review of human history from the time of savage life to the present day, a review of the development of language and customs and religions as well as of politics and economics, of law and education, of art and science. We cannot have one history written by historians and a second history written by psychologists. The psychologist cannot do more than impress on the historian that his explanations of historic events are unscientific as long as they disregard the results of scholarly individual and social psychology. The historian needs his psychology as the physicist needs his mathematics.

Historical Individuals.—This making use of psychology for the explanation of the historical processes does not necessarily involve a conscious reference to formulated psychological laws. It would generally be clumsy and pedantic, if the historian, who explains the development of a statesman in a biography or who traces the causes of a war, really spoke the language of theoretical psychology. The historian can take the most important mental connections for granted. They are furnished to everyone by the popular psychology of life, and however much scientific psychology may have to retouch such prescientific ideas, it is not probable that the leading convictions of popular psychology are entirely wrong. The knowledge that the suffering of injustice may lead to violent reactions, that in a state of excitement the members of a group are inclined to imitate one another, that love or ambition

can inhibit habitual impulses, that youth is more enthusiastic and less prudent than old age, or that race hatred can suppress sober reasoning, can be used by the historian without his consulting a psychological textbook.

On principle every explanation based on such matter of course statements is an application of psychology. The historian may the more often rely on the prescientific substitute, as it may be sufficient for his purposes to consider large units in the mind; the psychologist would resolve them into smaller parts and ultimately into psychological atoms, but these would have no bearing on the explanation of the historical event. Yet this justified reliance on the products of popular psychology may at any moment lead to scientific error. Subtle connections may remain obscure, superficial relations may be accepted where a detailed psychological statement would show much deeper causes, references to the unexplainable springs of the personality, entirely worthless from the causal standpoint, then become substitutes for the really needed explanation. Only a thorough understanding of scientific psychology in its individual and in its social aspect can make the historian recognize where his routine psychology can render sufficient service and where the methods of theoretical psychology, and even of experimental and physiological and pathological psychology have to be introduced.

This exact study refers as much to the individual personalities as to the groups. The laboratory psychologist to-day uses so-called psychograms, that is standard blanks into which the answers to hundreds of detailed questions can be filled for a particular individual. He needs such psychograms for theoretical purposes in order to analyze the inherited and acquired mental dispositions and traits of an individuality. He needs them still more for practical psychotechnical purposes, for instance, in order to foresee what mental development may be expected from a patient or a criminal or a pupil, and so on. But the

ideal analysis of the historical personality would demand such a psychogram for an individual of the past too, if his thoughts, emotions and actions, as they enter into history, are really to be explained. The historian's psychogram of his hero ought to show how far the mental traits of his ancestors and especially of his parents, the common mental features of his racial group, the influences of climate, his bodily traits and his health, his experience, his acquaintances, his reading, his education, his traveling, his economic circumstances probably shaped his mental structure. The social atmosphere in which he lived, the temperament, the character, the intelligence, the rhythm of activity, the type of attention, of memory, of imagery, the mental habits and abilities ought to be analyzed as far as the available material allows.

This psychological analysis is most fruitful in the case of historic personalities from the sphere of cultural life. The leaders in religion and art, in science and literature, demand such an explanation of their work and their influence upon mankind still more than the heroes of war and the statesmen, whose achievements are more easily explained by means of the cruder conceptions of popular psychology. It is not impossible to connect the great differences of philosophical thinkers or of pioneer scientists or of great inventors with particular features of their imagery or their attention. The imagery of the philosophers or physicists who think the universe a world of substances and those who think it a system of energies is probably always different. Thinkers who visualize and thinkers who depend upon kinesthetic and motor images must arrive at different views of the world. Historians of science have divided the great leaders into romanticists and classicists; historians of philosophy have claimed that every thinker has in his nature an element of Platonism or of Aristotelianism. He has to be the one or the other, and whether the trend of his mind goes into the more ideal-


istic or the more realistic direction depends upon elementary differences in the psychical dispositions. The smallest divergences of attention or of associative tendency or of emotional trend may produce the strongest contrasts of life achievement, because these minimal influences which only the psychological analysis can discover cumulate through a lifetime. A slight inclination to prefer subordinated or superordinated associations may lead to the great differences of deductive and inductive scholarly production. A variation in the psychophysical power of inhibition may make the one a martyr and the other a traitor.

Historical Social Events.—The explanation of the group processes is usually based on popular psychology too. But it is evident that the opportunities for exact psychograms of the social mind are no less abundant here. The historian must know the mental traits of a people, or a race, or of a local community in order to explain the political or social or religious or cultural reactions. The statistical data, the objective products of the past, direct observation of typical members of the group, must be used to draw the detailed mental picture. The geographical influences, the technical conditions, the economic background, the legal forms of community life, must be estimated as causes of psychological dispositions. The temperament, talent, character, and intelligence of the social group, its suggestibility and excitability, its originality and its energy, must be examined like the mental features of a single individual. But at the same time the general results of social psychology must be applied: the laws of the formation of classes, of the growth of social contrasts, of fashions and customs, of social decay and corruption, of the influence of religion, of prosperity, of prevailing individualism or communism, of belief in liberty and of belief in loyalty, or of the influence of women, and so on. The knowledge of the particular social mind and of the general psychosociological laws is equally nec-

essary for a true explanation of a historic group process. The explanation of individuals and of masses must be constantly combined. The historian of religion must understand individual psychology to explain the development in Buddha, and social psychology to explain the spreading of Buddhism in Asia.

The historian needs psychological explanation not only for the life process, but also for the objective products of social work. The history of technic from the prehistoric tools of the savages to the most complicated machines of our factories is the history of objects which must be explained by reference to psychological conditions. A popular haphazard psychology cannot possibly fulfill this demand. The exact physiological psychology of the motor impulses must be understood. The saving of energy which the rhythmical movement makes possible, the advantage of intentional impulses which can be easily combined and the disadvantage of impulses which interfere with each other, the effects of motor impulses to the large muscles on the efficiency of the small ones, the possibility of organizing will impulses into group units and of making them automatic and many similar psychophysiological conditions must be considered, if the historian is to explain the development of technic. Or we may point to the miracles of the *church*. They cannot be grouped in the system of causes and effects, if the historian knows no more about autosuggestion and heterosuggestion, about inhibition and emotion, about imagination and individual endeavors, than popular psychology furnishes.

Even this explanation of the social products must often be linked with the most detailed experimental work. The observations and classifications which are reported in the history of *science* cannot really be explained, unless the exact details of the sensation and perception and reproduction are carefully recorded. In astronomy, for instance, the stars were always grouped into classes which



were based on very unequal arithmetical differences of light intensity, but the psychophysical investigations of the laboratory have demonstrated the cause. The difference between two pairs of stars appears equal, if the lights are in the same relation. The history of *languages* shows how they changed through the psychological tendencies of the speakers and through contact with other languages in the minds of the masses. Involuntary formations of analogies, facilitations of the motor impulses, habitual associations, inhibitions of speech impulses and similar processes lead to the transformations. The student of the history of language is accustomed to collect such material and to deduce from the successive forms the principle of change which must explain the single facts. But the linguists have only begun to recognize what a great gain can come to them if they make use of psychological laboratory experiments which are devoted to these processes of association and inhibition. Experiments on the mutual interference of word ideas in their influence on the speech reaction can quickly illuminate the slow transition processes from one stage of the language to the next.

Or we may turn to the field of *art*. The historic account of architecture, sculpture and painting cannot explain the development, if it ignores the exact details of the effects which the artistic works produced. This involves not only the general problems of association and emotion, but even the subtlest processes of optical illusion, of color contrast, of form, of equilibrium in symmetry, of repetition. Everyone of such mental effects can be understood only if it is made independent from vague general impressions and is submitted to exact experimentation in the psychological workshop. Experiments have shown why the verse must be limited to a certain number of feet, and the stanza to a certain number of lines, why the rhyme must be at a particular place, why some feet in the verse can be replaced by others and some cannot be changed, why

the *cæsura* must be in a certain place. The explanation of the work the great artists have created thus finds its ultimate explanation in the painstaking psychophysical experiment.

To draw an illustration from the history of *music*, we may think of the surprising changes in the appreciation of different tone combinations. The old Greeks considered the octave alone as the true consonance, which gave a complete feeling of rest, while the fifth and the fourth were not really restful, and the third was altogether dissonant. Four centuries after Christ the fifth and fourth were in the same class of consonance with the octave: it is the third which is now in the intermediate class, and every other interval a dissonance. In the eleventh century the major third gained a place among the full consonances, while the minor third was still forbidden; in the twelfth century the minor third was welcomed. In modern times the musical world has added the seventh to its consonances. Such developments are not explained, if they are simply historically stated. Their explanation demands an insight into psychological processes which only the experiment can analyze. The experiment can demonstrate that a persistent hearing of tone combinations really produces a change in the mental disposition, by which the feeling of consonance is shifted. Only through such psychological analysis can we comprehend why every great composer—Hayden, Mozart, Beethoven, Wagner, Strauss, Debussy—was denounced in his own time and was welcome to the ears of the next generation. The dissonances which are often heard become actual consonances.

But whether we point to the cases in which the historian has to consult the records of laboratory experiments or to the more frequent cases where the fundamental conceptions and laws of individual and social psychology are adequate for the explanation of the historical processes, it is always the historian's work to seek for an explana-

tion of his material. The psychologist must set forth the necessity of applying psychology—and for this reason we had to outline the situation here—but the application itself is a part of the historical sciences.

History and Purposive Psychology.—We have ignored so far one other reason why it sometimes appears as if the psychological explanation of the world's history belonged to the psychologist and not to the historian. Many historians, and surely not the worst among them, are convinced that their highest task is *not the explanation, but the understanding of the past of mankind*. Their historic work deals with the interpretation of the great leaders and of the nations. The meaning of a significant life and of a great movement but not the causes interest them. Such a historian is convinced that the purposive view of history alone fulfills his mission. The causal analysis of the past appears to him, therefore, as extraneous, and he has the natural tendency to relegate it to the quarters of the psychologist.

But this idea evidently takes a new character in the light of our discussions on causal and purposive aspects of the mind. We have recognized that a full account of the mental life always requires both points of view. Causal and purposive psychology appeared to us coördinated. To interpret the inner life of the statesman or thinker or poet or religious leader and to show the meaning in the thoughts and emotions of the masses, must therefore be recognized as psychological treatment too. It is an application of purposive psychology, just as the other study was an application of causal psychology. The one cannot be separated from the other and if the one belongs to the historian, the other belongs to his sphere too. The psychohistoric interest must have the same double face which our daily life experience has shown to us. The life-work of Napoleon may be psychologically explained, but it must, above all, be psychologically interpreted. We

may ask for the causes of his decisions on the battlefields, but the true pulse of history is felt still more when we study the meaning of his decisions. We may describe and explain the mass movements of the French Revolution, but we have not understood it until we interpret the meaning in the minds of those clashing groups with the help of purposive psychology.

PART II. THE PSYCHOTECHNICAL SCIENCES

CHAPTER XXIX

EDUCATIONAL PSYCHOLOGY

The Educational Purposes.—The material of the psychotechnical sciences might be classified and presented from the point of view of theoretical psychology. Then we should pass from one mental function to another, and with each one raise the question in what fields of practical life it might be applied. The function of memory, for instance, ought to be understood by the teacher who demands memory work from the pupils, by the lawyer who depends upon the memory of his witnesses, by the merchant who relies on the memory effect of his advertisement, by the physician who examines the memory defects of a mentally abnormal patient, and by many others who are engaged in practical pursuits. Processes like attention or suggestion or imitation or volition are significant in almost every practical endeavor, and indeed it would not be impossible to group the psychotechnical data under such psychological headings. Yet the true meaning of the psychotechnical sciences would be suppressed by such a method. Everything would appear a mere appendix to theoretical psychology, without any independent rights of its own. The special applications would be degraded to mere chance illustrations. They would not be held together by a common principle. The material would be scat-

tered, and we should never be sure whether or not important fields of practical psychology were overlooked.

We can expect unity in the study of applications only if we subordinate everything to the idea of purpose. Every application is controlled by the wish to fulfill some practical purpose. It must do some good in the human world, and the ideas of these various purposes must give unity to the whole. Hence we shall organize the facts nowhere with reference to the mental functions applied, but always with reference to the aims to be fulfilled. We shall not separate memory, attention and so on, but law, medicine, education, commerce, industry, art, science, social reform, and to each of these parts the greatest variety of mental functions will be made contributory. Moreover we must try to present consistently not only these general divisions, but the subdivisions as well, with reference to the purposes of life. We must not only bring everything together which serves legal interests, but we must distinguish again the various aims of the lawyer; we must separate the weighing of evidence from the securing of confessions. When we speak of the aims of the physician, we must separate the purpose of diagnosis from the purpose of prognosis, the treatment of mental abnormalities from the treatment of nervous diseases.

The order in which the chief groups are to be discussed is necessarily to a certain degree arbitrary. If we give precedence to the study of educational purposes, it might well be claimed that this first place belongs to them for historical reasons. For a long while this chapter monopolized the name of applied psychology, and certainly in recent years the greatest amount of specialistic work has been done in this field. It is not surprising that this is the case. The boys and the girls of the classroom offer material for study which is always at the disposal of the observer. Whoever wants to make experiments on witnesses or workingmen or artists or patients has to fight

with numberless practical difficulties, but the school-children are always ready and glad when the instruction is interrupted by experiments in the service of science. Above all, the school-teachers themselves stand so much nearer to psychology than the judges or physicians or manufacturers. They have been in touch with psychology throughout their vocational life, and they feel the need of an understanding of mental conditions more immediately. The interest of parents and friends of children has contributed not a little to the gathering of material. When we spoke of the limitations of applied psychology, we could not avoid mentioning some pedagogical dangers of this movement and adding a word of warning. Moreover it is evident that the ease with which parents and teachers may carry on psychological experiments with children can lead to a certain superficiality, for a true experiment requires a most careful study of all the conditions involved. Yet it must be acknowledged that pedagogical psychology has really been developed in the last decade into a well-consolidated psychotechnical science with an abundance of suggestive material and significant advice. Here we can trace only its outlines.

In this field especially it is customary to distribute the facts in purely psychological groups, like memory, apperception, habit, attention, and will. But we must ignore here also every demarcation line which is not demanded by the difference of purposes. This opens, to be sure, the question of what the real purpose of education ought to be, a question far too large to be answered here by the way. There is no unity of opinion among the schoolmen, and even the same institutions may be interpreted in a different spirit. In the eyes of one party education ought to prepare everyone for a definite vocation. Every feature of school life ought to serve immediately useful ends. The other party claims that the aim of education is to make the youth willing and able to serve

the realization of human ideals. The practical technic of the vocations then becomes secondary: the cultural value of education, the training of the personality, the development of that which is to be common to all, become the primary end. But we cannot overlook the fact that the psychologist's help does not refer to these ultimate ends, but rather to the more immediate purposes which are common to all educational systems. We can isolate these definite educational purposes without settling which aims they are finally to serve.

There are, first of all, three pedagogical ends which exist for every educator, whether his purposes are vocational or cultural, or whatever they may be. *He must supply information, must train the pupils in certain abilities and must awake in them certain interests.* Whatever the final life activity of the pupil and student is to be, there is none in which these three psychological elements do not have to coöperate. Whoever is to fill a place in society must have acquired for it some knowledge, some ability and some motive power; and it is never possible to substitute any one of these three for the others. Education is from every point of view a preparation for lifework. To provide the youth with these three fundamental dispositions is the immediate purpose of all education. The knowledge may be that of the alphabet or that of the latest scientific discovery, the ability may lead from the first efforts of writing to the highest efforts of technical skill, and the interests may move from the simplest curiosity to the highest moral idealism. Every educational influence must proceed in one of these three lines. The first three educational questions of applied psychology, therefore, ought to be: how can psychology help toward the selection of the best means by which the teacher may supply information, train in abilities and awake interests? But this leads to a further inquiry of most practical consequence: *how must the educator readjust these three en-*

deavors and combine them into a well-organized plan of instruction adapted to the mental life of the pupil? This organization of instruction is a new special purpose, and accordingly an independent problem of applied psychology.

The Imparting of Knowledge.—The knowledge which the pupil is to acquire must somehow enter through the senses and must therefore be material of perception. A clear, distinct, correct and vivid *sense impression* is, accordingly, the first condition for the gathering of information, and any insight into the conditions of sense perception may help toward the improvement of the teacher's work. The unimpeded functioning of the sense organs is the first factor which is too often neglected. Short-sightedness, astigmatism, deficient hearing are too frequent conditions for mental backwardness. But a similar inefficiency of the sensory impressions must result when the stimulus lacks intensity or sharpness of outline. The vagueness and indistinctness of the sensory starting point in the mind hinders the whole mental response, retards associations and leaves insufficient traces for the memory.

The child's possibilities of perception are not fully developed. The discrimination of differences of very light colors or still more of very dark colors like brown and blue offers difficulties for a long-while. The perception of time intervals is most inaccurate, and while in a child of seven years the perception of distances shows nearly the correctness of that of an adult, the perception of forms is still insufficient for subtle tasks. The perception of rhythm is still little developed. The teacher should constantly consider these shortcomings of the young mind. He has no right to presuppose that the picture which he shows awakes the same impression in the child as in the adult. Moreover we have steadily emphasized the intimate relation between perception and motor reaction. The kinesthetic sensations from the reactive movements enter into the

perceptions themselves, and the central motor innervation is responsible for the vividness of the perceptive impression. We must therefore add the further pedagogical demand that the teacher give attention from the start to the development of motor reactions in response to the objects to be perceived. The child must follow with the eyes, fixate and accommodate, must draw what he sees, speak or write what he hears, in the service of the perfect perception itself.

This leads us to the importance of *attention* for the acquisition of knowledge. In its crudest form, of course, we direct the attention of the child by pointing to this or that detail, by underlining and accenting, by demanding a bodily position in which interfering stimuli are excluded and the sense organs adjusted to the perceptions, by demanding speech reactions: in short, by focusing all bodily responses on the important object. Everything which is loud and shining, which is moving and changing, or on the other hand, which is familiar or which awakes curiosity and emotion, controls such focusing reactions most easily. Where such reënforcements from without are lacking, the attention must be guided by associations which may either rise from the impressions themselves or which may be prepared in the pupil's mind beforehand by the teacher. Or finally the mere idea of attention and the effort to attend may keep the channels of discharge open and thus produce a vivid experience through a voluntary attention without associational help.

The psychological tact of the teacher will suggest how to find a middle way and how to avoid the extremes. It is clear that a sensory attention which depends entirely on the external impressiveness and which appeals to the mere instincts is ultimately inefficient. It leaves the power of voluntary attention untrained and soon reaches the end of its possibilities. Constant alternation is necessary. The teacher may make the perceptions impressive by his loud

voice for a little while, but if he were to shout all the time, an adjustment would set in by which the stimulus would become ineffective. Every appeal to curiosity, every mere amusement, or any external impressiveness, is therefore effective only when it is rarely used. On the other hand, the continuous appeal to the voluntary attention must overtax the psychophysical resources. Fatigue sets in, and the fatigue sensation in itself is a stimulus for antagonistic reaction; the mind wanders, what was inhibited becomes vivid, what was attended fades away. The most satisfactory result can be expected when the attention is directed neither by the appealing qualities of the stimulus from without nor by the mere good will to attend, but by the ideas which the pupil's own mind supplies in connection with the attended objects of perception.

The psychological experiment demonstrates the great *individual differences* in the character of attention to outer impressions; and the teacher cannot afford to ignore these variations. If an object is shown which contains many colors and many forms, there will be some children in the class who are able to concentrate their attention on the colors so fully, when they are asked to do so, that they will later be unable to give any account of the forms, and vice versa. Others may concentrate their attention on the colors, and yet at the same time may be sufficiently impressed by the forms to keep them in mind. We have hardly the right to claim that the strong concentration power of attention is the only desirable condition for educational progress. The mind which does not entirely inhibit the not attended, has other advantages for the selfdevelopment. We simply stand before two different types which must be respected as such. But experimental results show no less the individual differences in the rapidity with which the attention adjusts itself to changing impressions, or in the breadth of attention. One is able to hold together in his field of attention a complex of many

interested object while another can give his full attention only to a narrow field. But beside these individual variations the teacher must also take account of the undependable state of the child's attention. The disturbances and fluctuations in the young mind, the chance impressions which the attention shifts and fluctuates, fatigue preoccupies the child's attention more quickly.

We have characterized the attentive perception as clear, definite and vivid but we must add another aspect: the perceived object becomes apperceived. We saw that the psychological process by which the sense impression becomes a thing or a word is understood in its relation and is thus brought into its right setting in the pupil's mind. No impression remains entirely isolated in any consciousness. A perception without some slight apperceptive response may be called a scientific fiction. But everything depends upon the degree of apperception. The attention is the most favorable condition for the richest apperception of which the mind is capable. As soon as the attention becomes fatigued, the apperception crumbles. If we give our attention to a printed word like "elephant," we apperceive it at once in its full meaning. But if we fixate it for several minutes with an effort to keep our attention only on this one word, it soon loses its apperceptive unity. The meaning seems to fade away: naked letters stare at us.

To keep apperception alive, attention must be held by external or internal means. On the other hand, there can be no doubt that the material which is to serve as true information must indeed be apperceived and apperceived in its objective connections. What is meaningless to the child is educationally useless. Everything must be understood in its relation to the ideas which the pupil has gathered and this is valid for the scientific work of the professional student as well as for the first study of pictures in the elementary grade. Never psychology can teach

of the laws of apperception may become valuable for the guidance of the teacher. The careful preparation of the material in an order in which it allows apperception and yet demands the pupil's effort to secure the apperceptive grasp must be one of the chief cares of the thoughtful teacher.

Psychological experiments have often been carried on with reference to the various *stages of apperception* through which the child's mind passes, and also as to the various types. If a picture of a complex scene is shown to a child less than eight years old, he is inclined to apperceive the single objects, his attention often being held by a most trivial part. Then follows the stage in which the things, and especially the persons, in the picture are apperceived in their functions and activities. At about the tenth year, the local, temperamental and causal connections begin to interest the young mind, and finally a stage is reached in which a real intelligent analysis of the whole scene suggests itself. The rhythm of this development varies with different individuals, but the types of apperception vary still more. It has become usual to discriminate a descriptive, a connecting, a scholarly, and an emotional type. The one apperceives the isolated elements, the second apperceives the group in its connectedness, the third is controlled more by the associated knowledge than by the impressions themselves, and the last by the relation to feelings. All four types can be found in any group of pupils as well as in any group of adults; and yet the particular apperceptive type of the child is on the whole more influenced by the tendencies of the fourth type. The child is more ready to give a subjective interpretation to the apperceived surroundings. His own feelings are projected into the things.

If the aim of the instruction is the understanding of the world, and this understanding is based on the apperception, and this apperception is dependent upon the con-

actions of the perceived material with the ideas in the pupil's mind, everything finally depends upon the acquisition of its associations. No mind can furnish any new elements by mere imagination. The associations which arise in the service of apperceptions must be reproductions of earlier impressions. If these reproductions arise in consciousness in the order in which the primary impressions were received, we speak of memory, but if their order is controlled by the demands of feelings, we call it imagination. Psychology can in no way furnish more immediate assistance to the work of the school than by determining the laws of memory. It is therefore not surprising that in recent years the largest part of educational psychology has been devoted to the experimental study of the *processes of learning*.

The psychological experiment demonstrates how the exactitude decreases with the passing of time, at first rapidly and then slowly, how rhythmical learning aids in the reproduction, how learning in large quantities is more economic than learning in little, detached parts, and how a number of repetitions at one time are far less effective than the same number divided into several groups of repetitions. Mere repeated reading of a series is less efficient than a combination of readings and free memory renderings: reproducing the series by one's own effort leaves a stronger disposition in memory. The greater the demand which the series to be learned makes on the memory, the greater becomes the efficiency of the reproductive mechanism. Reading aloud is more favorable to rapidity of learning than silent reading. And we might add a hundred similar observations. Nor has the teacher a right to overlook the differences of visual, acoustical and motor *types of memory*. If an auditory series is presented to a strong visualizer, he feels obliged to visualize the word as soon as he hears it, and thus takes additional time, which greatly lessens the rapidity of learning. The pupils of the acous-

tical type have difficulty in learning that which they only see. Those who are predominantly of the motor type naturally profit most from the opportunity of speaking aloud or writing that which they are to impress on their memory. The children of the motor type are more inclined to take hold of words, as these more easily offer motor cues. Since the intellectual development of the individual takes its normal course from the ideas of concrete objects to words, the motor type seems to be predisposed to rapid intellectual progress.

The child, we saw, has a very weak power of immediate recall, but as soon as he has really taken hold of the memory material, he retains it relatively well. The growth of the memory is not continuous. It grows most rapidly at about the tenth year, while it proceeds slowly at about the fourteenth. A point of great importance, too little valued as yet, is the fact that the psychophysical process of learning continues after the end of the presentation and demands a period of undisturbed internal organization in order to make that which was learned available. A disturbance or any strong intellectual engagement after the learning may destroy the retention entirely. If the child is obliged to make strong mental efforts immediately after the process of absorbing new memory material, the learning must be to a high degree frustrated.

The Development of Abilities.—Mere knowledge, that is, mere information without ability to make use of it, cannot be the goal of education. But the developing of the abilities does not refer only to external acts like reading and writing, but just as much to intellectual activities like attending, thinking, calculating. We can most easily analyze the factors contained in such voluntary actions in the case of the external motor functions. We can study how the child learns to walk and to speak, or how the grown-up person learns the technic of a musical

instrument or the writing on a typewriter. Yet we cannot emphasize too much the similarity between the external and the internal actions, between the movements of the limbs and the movements of the thoughts. To remember, to invent, to attend, to observe, to reason, means above all to adjust inner impulses to the final aim, to suppress and inhibit those which interfere and to excite and to reënforce those which lead forward. The training in external actions is practically the model process for the training in all psychical abilities. If we are to gather from the training in motor abilities the principles for the training in abilities in general, we ought to put emphasis on the following psychological factors. First we must make use of the involuntary reflexes; secondly, we must make use of the instinct to imitation; thirdly, we must resolve the complex action to be learned into its elements; fourthly, we must reënforce the activity by suggestion; and, lastly, we must mechanize the process by repetition.

The *involuntary motor impulses* and reflexes are indeed the given material without which no development of voluntary powers can be understood. There are numberless short cuts and substitutions, but somehow all learning of an intentional activity starts from the experience of involuntary reactions which come up from the inborn psychophysical dispositions. In a corresponding way we have to accept the tendency to *imitation* as the inborn disposition which is not learned but which precedes learning. No child would learn to speak who had not the instinctive impulse first to produce sounds and secondly to imitate sounds. This imitation is at first imperfect, but it is just the incompleteness of the success which drives the child forward. The most essential further step is the *resolution of the action* into simpler motor functions, which slowly become combined. Whether the child learns reading or writing, dancing or swimming, carpentry or piano playing, the whole set of simultaneous and successive move-

ments must be built up by imitating the single actions which in themselves are useless for the final purposes.

A skillful training demands no less the suppression of opposing impulses, and this is the place where suggestion has its chief task. Finally there is no learning of motor ability without *repetition*: every new performance decreases the resistance in the motor path until the response to the stimulus becomes automatic. The formation of such habits is the significant end. The trained piano player does not exert his will for the special finger movements. As soon as the idea of playing controls his motor setting, the black dots on the paper produce the immediate impulse to the right finger actions. It is evident that the coöperation of these five psychophysical factors demands the most perfect adjustment, if the result is to be reached in the shortest time, with the smallest effort and with the most finished effect. The desirable alternation between periods of training and periods of rest, the rhythm and rapidity of repetition of one group of movements before a new set is learned, the most economic analysis of the complex, the various habits of manipulation and of control, the associations formed between the sensory impressions and the actions and many other factors must determine the advance.

The teacher must take care that the particular types of difficulties which the pupil finds during this learning process are promptly overcome as they appear. He must be helpful to the child in the acquisition of right methods, discouraging of all unnatural and circuitous ones which involve loss of time and energy. He ought to minimize the formation of disturbing habits, he must make sure that the learner does not push himself forward too fast at the critical stages, and he must show that way in which the elemental habits, as soon as they are perfect, may be organized into habits of higher order. This is true of read-

ing and writing as well as of the most complex actions which the future engineer or physician has to learn for his profession. But the chief function of the teacher is the prevention of movements which interrupt the formation of habits. Exceptions are always dangerous. It is even important to avoid repetitions in a stage of fatigue, in which the gain of learning is easily destroyed by the unsuccessful performances.

Exactly the same rules which bind the learning of motor habits are valid for the acquirement of *internal abilities*, for instance, habits of attention. The attention to complex combinations has to be built up from elemental habits of attending to simple stimuli. Here again the teacher has to make use of the involuntary acts of attention which precede the voluntary effort. Suggestion reënforces the formation and the training through repetition transforms attention itself into a habit. Everything depends again on skillful guidance and upon the rigidity of the discipline. Whoever has not learned early to concentrate his attention can acquire it later only with unusual difficulty. A psychomotor apparatus which is shiftless and which is carried away by every incoming disturbance and attraction cannot suddenly be used to serve serious ends. The habit of concentrating the attention has to be learned as much as playing the piano. The attention given to an end which is to be realized by work constitutes the habit of effort. The child must learn how to acquire this ability for systematic work.

Finally we have the same processes when pure thought is involved. The ability to proceed from the premises to the conclusions depends too upon involuntary movements of ideas which furnish the material and upon imitation which secures the technic of the logical process. The interfering fallacies must be inhibited, the complex thought processes must be built up from the elementary ones, and systematic repetition must develop the habit of grasping

the right conclusion. The ability to reach such a logical end must be learned like the ability to catch a ball.

The abilities for reading and writing which have been most studied in the psychological laboratory are educationally especially interesting. The old-fashioned method of learning to read by beginning with the alphabet evidently contradicted the psychological laws of development of complex abilities. The child had to name the single letters and the action of reading the word could therefore never be produced by connecting the elementary reactions. As the child knows how to speak before he learns to read, the unity of the speech impulse for the word exists before the reading lesson. The association between the whole picture of the word and the language seems to be the natural starting point. Yet correct reading demands that every single letter influence the reaction. We ought therefore to connect a special motor expression with every single sign. The synthesizing of these elementary processes into complexes is practically unlimited in the field of reading, as the words must be combined in sentences. The experiment shows that the trained reader never moves his eyes steadily from one end of the line to the other, but that the eyes make jerking movements, jumping four or five times in a line from one resting place to another. If nevertheless the mental process of reading remains unbroken, we must presuppose an extremely complicated organization of automatic functions. A whole complex of words must be grasped by one psychophysical act. A short sentence is indeed recognized as an optical unit.

Subtle experiments with reference to the pressure of the writing pen have shown that the writing impulses for whole words and even for phrases also become organized into such units, reactions in which the motor impulse for each single letter is a subordinated component of automatic character. The child must begin with the imitation of the single lines and curves, and must be trained in habit-

ually binding them together, until finally the mere idea of the meaning of the word is sufficient to give one impulse for the totality of these subordinated automatic acts. The same processes characterize the pupil's progress in drawing and playing musical instruments, in manual training work and domestic work like sewing, and on a higher level in the acquirement of professional technic. But the education in good manners and tact, in habits of cleanliness and hygiene, and in a certain sense in moral behavior, demands these same psychological processes of upbuilding the complex from the simple and of forming habits through repetitions without exception.

The Arousing of Feelings.—We have insisted that information and ability can never be sufficient for a life-work. Every vocation and every avocation demands a third component: a motive power which leads to the application of knowledge and ability. Knowledge and ability are dispositions and interests must make them active. The personal desires like those for the satisfaction of hunger and thirst, for comfort and for absence of pain, do not need any training. They are given as inborn instincts. Around them clusters the large group of selfish desires which gain their special form from the social conditions: the demand for luxury and power, for social honor and protection against needs, for personal adornment and the accumulation of wealth. But the mechanism of our social world for which the school educates the youth must demand very different groups of interests, if society is to fulfill its purpose. The individual must learn to take part in the interests of his fellowmen and in the ideal interests of truth, beauty and morality. In the vocational life of most men and women several of these groups of motives are intertwined. Selfish interests and social interests and ideal interests generally work together so that the individual can hardly tell where one ends and another begins.

These interests must be developed by education. Just

as no abilities can be developed without the given disposition to motor reactions, no feeling attitudes can be formed without simple organic experiences of pleasure and displeasure as starting points. Moreover the tendencies toward strength and weakness, toward quickness and slowness, toward persistency and instability, in the feeling reactions also evidently belong to the inborn dispositions: external training does not fundamentally change the temperament. Yet the educational influence on the emotional life of the child and on the development of his satisfactions, and accordingly on his motives may be no less thorough than on his knowledge and his abilities. Any insight into the mechanism of suggestion, inhibition and imitation can be made profitable for the moulding of feelings.

The demands of the infant are entirely egotistic. To create altruism and idealism does not mean to create new emotional elements, but to connect the feeling values with different groups of experiences and to detach pleasure and displeasure from the mere gratification of the instinctive personal desires. This is the place where the humanistic instruction has to build the psychological bridges. The instruction in history and literature should especially emphasize this personal element and enlarge by suggestion the possibility of useful emotional response. From a psychological point of view nothing is lost from the value of ideal interests when we recognize that even the highest moral feelings may be learned by the individual through associations of strictly personal pleasure and displeasure with certain ideas of behavior.

Our rewards and punishments may reënforce these feeling values and attach them to ideas which were at first indifferent. Instinctive imitation and the power of suggestion are essential for this upbuilding process of higher feelings. It cannot be denied that both are easily disturbed by the suspicion of artificiality which may result in the pupil's mind when he notices a scientific, calculating atti-

tude on the part of the teacher. The teacher who is carried away by his enthusiasm and by his belief in truth and beauty and morality may therefore actually arouse in the pupil's mind a deeper longing for ideal values than another who proceeds in a more psychological spirit. But however much the teacher may rely on the inspiring influence of his enthusiasm this too is of course an influence which can be decomposed into elements of stimulation, imitation, association and inhibition.

Finally even the simple feelings have their characteristic organic expression, especially their relations to muscle contractions. On the one side we know that the sensory effects of these activities themselves enter as parts into the emotional experience. The exciting or suppressing of the movement thus involves an accentuation or an inhibition of the actual feelings. On the other side the central innervation of those motor processes is itself a condition for the feeling. The control over the movements of expression can thus ultimately become a control over the emotions themselves. Going through the movements of caresses favors a feeling of tenderness and carrying out fighting movements reënforces the emotion of anger. This interconnection between action and feeling with its importance for emotional education is certainly not confined to these clumsy actions in which arms and legs are involved. It has the same importance for the finest motor innervations, for the intonation of the voice and the choice of words and even more internally for the choice of thoughts and ideas.

The Work of the Pupils.—We have recognized that all education has three different purposes, the furnishing of information, the training in abilities and the arousing of interests. But it is evident that the work of the school devoted to the fulfillment of these three groups of demands must find its chief problem in the practical organization of these three kinds of efforts. The school must readjust

them to one another, must adapt the whole work to the limited powers, capacities and interests of the child; it must correlate it to the given time and means, to the social conditions, to the demands of hygiene and health, to the home and to public life, to the preparation and abilities of the teacher as well as to the individual talents and inclinations of the pupil. This most complex work of organization certainly is at every step dependent upon the laws of mental life and a practical application of psychology is nowhere more essential in the educational field than here.

Each of the three groups of educational influences demands *work on the part of the pupil*. Whether the child learns data to increase his knowledge or practices calculations to develop his ability or reads literature to cultivate his feelings, he must exert effort in order to profit from the work. Thus the first question of economic organization may be how to secure the maximum of efficient work from the pupils. In the service of this problem the experimental psychologists have aimed to distinguish the influences which training, fatigue, adjustment, effort, stimulus, interest and other psychophysical conditions exert on the amount of intellectual labor. If the problem is to be solved with the exactitude of the laboratory experiment, artificial conditions must be introduced which allow a standardizing of the work. The favorite material has been the adding of figures. If the rapidity of the process and the number of mistakes are measured when a child adds one figure to another through a continuous series during a long period, the fluctuations and changes can be determined quantitatively.

The profit from the training through repetition, from periods of rest, from the excitement of approaching the end and similar stimulations, will show as clearly as the loss through fatigue, through declining interest and through poor adjustment. No one overlooks the fact that such laboratory experiments are artificial without the rich-

ness of a real school exercise, which offers far more stimulation than such a uniform, continuous task. The joy in the work under the conditions of a wholesome school life can introduce energies which are lacking under the conditions of the experiment. But as soon as these various factors are analyzed and clearly understood in their correlations, the results can be applied to the practical conditions of real school life, just as the simple memory experiments with nonsense syllables have proved suggestive in the learning of material which has a meaning.

The most important influence of negative character is *fatigue*. No true success can be bought by the psychophysical exhaustion of the pupils. Both the stages of fatigue and the most economic restoration of the mental energies can be examined by experimental methods. A frequently used test requires the children to fill blanks in a story. The printed page contains open spaces for syllables or letters which the child is to supply. His attention to the content is needed in order to perform the task, and the rapidity and correctness with which the test is carried out indicate the degree of efficiency of those mental functions which are central in the regular school work. The fatigue of attention can also be quickly measured by determining the correctness of calculation. The mere rapidity of calculation may increase steadily, in spite of the fatigue, because the influence of the training prevails, but the increase of the mistakes is far greater. Frequently indirect methods are applied which measure not the fatigue itself, but its psychophysical symptoms.

The objective measurement of fatigue is pedagogically the more important, as the subjective feeling of fatigue is rather unreliable. A feeling of fatigue may come up habitually after a small amount of effort before any undesirable effect on the central nervous system is to be feared. The child who associates this illusory feeling of fatigue with all earnest labor must learn to overcome the slight

weariness by new effort. On the other hand there are not a few who are liable to approach dangerous exhaustion without any marked feeling of fatigue. A neurasthenic disturbance may indicate later that the safety point was passed without any inner danger signal. The experiments seem to indicate that mathematics and those lessons which involve physical activity such as physical exercise and singing have the greatest fatiguing influence, next to them the languages, after them the naturalistic sciences, and then the technical subjects. While the fatigue steadily grows, yet it is not wise to put the most difficult subjects into the beginning of the day as the first period is needed for the adjustment and warming up. But certainly the last hours of the day ought to be left for the easiest subjects. The younger pupils become fatigued much more rapidly than the older ones. But, above all, a pupil is the more fatigued by a piece of work the less able he is to master it.

The influence of the *pauses* which are to overcome the fatigue offers new psychological problems. In themselves they restore the lost energy, and therefore the more pauses, the less fatigue. Yet at the same time the pause interferes with the adjustment which had been acquired, and the total effect of frequent interruptions may thus be more harmful than helpful for the work as a whole. The recreative effect of the recess decreases with the length of the preceding task, and the correlation between the restoring and the disturbing influence of the pauses demands subtle psychological study. A similar situation results from changing among various kinds of intellectual engagements. The transition from one subject to another or in the same subject from one way of treatment to another, like reading, speaking, hearing, writing, may involve both gain and loss. Unused energies enter into action and the children, after a short period of adjustment, may perform the new task with perfect freshness. But this advantage

is outweighed by a distinct disadvantage, when the first subject is given up after too short a time. The psychophysical setting is changed before its effect is reached. Experiments indicate that it is much more difficult to learn two different sorts of material in rapid alternation than to learn first one, then the other.

Much less attention has been given to those influences which improve the work not by removing fatigue, but by stimulating the effort. Especially the psychology of punishment and reward and of the whole *disciplinary effect of authority*, has not been made sufficiently accessible to the exact methods of the laboratory. We know that the efficiency can be whipped up by the fear of punishment or by the hope of reward, that the pressure of an examination or of a competition can stimulate energies which are inactive under normal conditions and can produce inhibitions of counter-impulses and of fatigue feelings to an extraordinary degree. No school can be without such helpful influences of discipline, but their value after all lies not in the unusual effect which may be produced in a particular case through a punishment or an appeal. The chief psychological effect which an atmosphere of authority and serious discipline will produce is the training in the habit of continuous effort. The discipline must not lack elements of cheerfulness or discouragement will set in. But this cheerfulness must not interrupt the steadiness of the authoritative demand for serious effort. If a real habit of thoroughness and seriousness is to be formed in the interest of efficient work, there must be no exceptions and intermissions. Looseness of work and an undisciplined go-as-you-please method in occasional periods are not recreations from effort, but injurious disturbances of good intellectual habits.

The Selection of Studies.—Utilitarian considerations put a premium on all those studies which appeal to the liking of the individual child and are from the start ad-

justed to his natural personal interests. Such studies will easily hold his attention, will make his progress rapid, and may be practically useful for his later vocation. But while none of these considerations ought to be ignored, the educator must not lose sight of the opposite group of facts. The studies which move along the path of least resistance in the child's mind are least fit to prepare him for the fulfillment of those demands which the drudgery and hardships of life will later make on his psychophysical energies. He must have learned to devote his attention and effort to that which does not appeal to his involuntary response. The application of psychological principles certainly will not lead to the demand that studies be preferred which are repulsive to the tastes of the pupil, but the other extreme, which makes the whim and fancy of the pupil himself the decisive factor in the election of courses, is no less detrimental. The appeal to the spontaneous energies and the training of the power of inhibition and of voluntary attention are equally needed. The organization of studies has to be a compromise between these two antagonistic psychological demands.

The arrangement of studies in the compass of the school must count with still other, ultimately psychological conditions. The list of possible studies which might enlarge knowledge or help to train in abilities or to arouse interests is of course limitless. The sociological conditions must be paramount in the selection. The child is to be educated for an efficient life in the community in which he is brought up, and that accentuates the need for certain studies and eliminates many others. The preference for the literature of the mother tongue or for the national history or for the selection of foreign languages, has not psychological but sociological reasons. But progress from the simple to the more complex, from the elementary to the higher studies and at the same time the limitation to a few essential groups of studies in place of a superficial

treatment of a large number, are determined by the structure of the mind.

It is again an adjustment to the mental conditions—and this forms the real center of the problems in the organization of studies—that *each study is to be chosen so that it may serve as many educational purposes as possible* at the same time. The material of instruction which enlarges knowledge can very well be presented in a form in which it stirs the enthusiasm, feeling motives and higher interests, and may furthermore be studied by methods which train the child's abilities. There is no psychological antagonism and no psychophysical interference among the acts which may fulfill these three groups of demands. On the contrary, they may reënforce one another. The emotional interest with its personal elements intensifies the attention by which the associative learning is facilitated. At the same time the emotion overcomes the inhibitory influences in the reactions. This secures the desired discharge and helps in the training of abilities.

The problem of the choice of studies, finally, is intertwined with the psychological question of *specific training in the interest of general training*. If it were psychologically true that mental training in one sphere left every other sphere untouched, studies serving formal discipline would have to be eliminated from the curriculum. But while it is undoubtedly true that the value of such transference of effect was exaggerated in the popular educational psychology of earlier days and that many of those claims had to be abandoned upon experimental examination, the phenomena of cross-education must certainly be acknowledged. The transference of training in one field to other fields has been demonstrated experimentally in a large number of different regions of mental life. We know that practice with sound stimuli increases sensitivity to tactual and visual stimuli. Discrimination of sound intensities carries with it the ability to discriminate inten-

sities of brightness. Space discrimination by the finger tips of one hand gives training for discrimination by the other hand. Practice in rapidity of tapping and exactitude in fencing become effective for the unpracticed hand. The training for neatness in one group of studies proves helpful for neatness in any other group of studies. The training in the inhibition of distractions in one situation teaches the pupils to ignore them in others. The training in learning poetry makes the children more able to learn prose with ease. The training of the memory for nonsense syllables is highly effective in strengthening the power to learn numbers, stanzas, and poetic forms. Experiments in these and many similar directions in recent years leave no doubt that the educator may very well rely on the training in one mental power through the training in another. But the experiments make it rather evident too that the effect is the stronger the more the two functions have common elements or are bound together by an overlapping mental function.

Adjustment to Individual Differences.—Until now, we have as far as possible abstracted from the individual differences of the children. Yet there is no school class which does not show different types of apperception, of imagery, of memory, of association, of attention, of feeling, of ability to learn from practice, of fatigue, of ability to recover from fatigue, of endurance, of suggestibility and of general intellect. Experimental pedagogy has so far done little in transforming the theoretical study of individual differences into educational schemes. There is no doubt that great difficulties stand in the way. Strictly individualistic education, entirely adjusted to the peculiar traits of the specific child, is practically impossible, and above all highly undesirable. The education in not too large classes is for many psychological reasons the most desirable. Pedagogical experiments have directly shown the advantage of class work over isolated work, and the

effects of imitation and suggestion, of intercourse and social stimulation, which the class work furnishes, are of incomparable value.

As soon as class work is accepted in principle, a real adjustment of the instruction to the individual differences becomes impossible. It might not be difficult, as has been proposed, to separate classes of visualizers from classes of children with essentially motor or acoustic imagery, and to adapt the methods of teaching to their traits. In the visualizing class the teacher would be more successful, if he wrote the material on the blackboard; in the class of acoustic memorizers the teacher would rely on the spoken words; and in the class of children with motor imagery he would insist on the motor activity of the pupils themselves in the interest of memorizing. But it is clear that such classes would at once combine very different types, for instance, of apperception, or of association, or of attention. The expansive and the focusing attention, the coördinating, the subordinating, and the superordinating tendency of association, the descriptive, the imaginative, and the scholarly appreciation, may go with any type of imagery. Children who are quickly fatigued, and those who are slowly fatigued, children who grasp quickly and those whose minds work sluggishly, may be distributed in every one of these classes. Each of the mental functions might furnish new principles of classification, and the principle of class work would practically have to be given up, if only children of identical combinations of mental traits were to be taught together.

Moreover, the acknowledgment of the individual differences is no sufficient basis for the claim that education must be made subservient to the given tendencies. If the task is only to teach the child a certain number of facts, it will be easiest to teach according to the method which appeals to his peculiar type of mind. But, if the task is to educate a child, the quickest method for imparting infor-

mation may not, for that reason, be the wisest method for general training. It may be considered an important part of school work to bring to a certain development just those mental features which nature has provided only in rudimentary form. Those who have the scholarly type of apperception ought to be trained in imaginative apperception; those whose attention is strongly focused ought to be trained in a certain expansion of attention; those who are inclined to subordinate in their associations ought to learn to superordinate.

It is different with the question of special talents. If a certain activity depends upon a talent, it is unwise to force a perfunctory performance on those who completely lack the disposition. Exercises in singing are of no help to those who are entirely unmusical. On the other hand, the conspicuously talented pupil is unfairly held back if he is obliged to proceed at the slow pace of the average pupil. The sharpest contrasts may be found in the talent for mathematics.

In the center of pedagogical interest we find at present *the problem of grading the general intelligence*, which is to a high degree independent of the talent for special subjects. We recognized before that the characteristic function of intelligence is the ability to adjust one's mind to a task. The intelligence process should be cleanly separated from mere memory and imagination, association and attention. We want to know how far the achievement of the individual pupil is dependent upon his ability to perceive, to learn, to retain, to discriminate, and so on, and how far it is controlled by that central function of general intelligence. It is the one mental factor which is most significant for the later practical life, and one which ought to be considered most of all if the school work is to be adjusted to individual differences. Many efforts have been made to find psychological tests by which the degree of this intelligence can be quickly determined.

The value of these facts can be most easily discovered by studying the correlation between the results of a special test and the degree of intelligence which shows itself in the total work of a pupil throughout his school life. An experienced teacher with open eyes has, indeed, not much difficulty in ranking the pupils of his class according to their intelligence, without any reference to mere industry or good memory and similar functions, which the unintelligent may show, too. The test which seems best to correspond to this grading of the pupils by the teacher is an experiment in logical memory. If we read to a class a series of pairs of substantives, which have nothing to do with each other, like "lamp" and "oatmeal," and then read the first word of each pair, and ask the pupil to write down the second from memory, the results will show nothing but the strength or weakness of the mechanical memory. But if, instead of this, we choose pairs of words which are internally connected, like "lamp" and "light," the results show, if the list is long enough, that the differences of memory are entirely superseded by the differences of intelligence. The greatest number of pairs is remembered by those who are at the head of the graded list of the teacher.

A decisive advance was made when, in recent years, a large number of such intelligence tests were graded in adjustment to different periods of life—the so-called Binet tests. If we find that a set of intellectual tests to be performed in a definite time offer such difficulties to normal children of eight years that more than a half of the tasks remain unfinished, while about three-fourths can be completed by children of nine years, we have a definite standard for the psychological examination of the intelligence at that age. If a child of seven is able to solve those problems prepared for the children of nine, we have a case of supernormal intelligence. On the other hand, if a child of eleven can complete only the tasks for the nine-year-old class, and not those for his own age, we have a case of sub-

normal intelligence. Many efforts have been made to improve these tests by eliminating as much as possible everything which depends upon the chance acquisition of knowledge, upon fluency of speech, and upon mere memory. Moreover, by the addition of little technical tasks which demand an intelligent adjustment, like the opening of boxes fastened by complex systems of bolts, the possibilities of the examination have been greatly enlarged.

The tests cover the periods from the fifth year to the sixteenth. In the case of the five-year-old children the tests are as simple as the repetition of a sentence with ten syllables, the counting of a few pennies, the comparison of two weights, the copying of a square, the combination of a figure from two parts and so on. Children of six years are to repeat a sentence of sixteen syllables, to explain simple conceptions, like "fork," "chair," "doll," to point to the left ear, to discriminate which is the prettier of two extremely different drawings of faces. The statistics of countries agree that in the circle of normal school children about 50 per cent. stand on the level of intelligence which the tests suggest, if we calculate that every child can be counted in the class in which he solves at least three-fourths of the test problems. About 20 per cent. of the children are one year behind, and 20 per cent. one year ahead; about 5 per cent. are two or more years behind, and 5 per cent. two years or more ahead. The intelligence of the boys and the girls seems essentially equal.

The greatest value of these graded intelligence tests probably lies in the ease with which they allow the abnormal children, who are unfit for the usual class instruction, to be discriminated from the normal ones. Defective children can perform most of the tasks in the same order in which the ordinary children do. But the abnormal child falls more and more behind, and soon reaches a limit beyond which he cannot advance. It is a hopeless pedagogical effort by mere continuous repetition to force the defec-

tive children to intellectual tasks for which their intelligence is insufficient. But such a careful standardization is just the way to find methods of appropriate instruction, even for those whose mental energies remain on the level of early childhood. Of course such children with organic defects in their psychophysical mechanism must be sharply distinguished from those whose intellectual achievement stands on a low level on account of external disturbances which may be cured. Poor hearing, defective vision, impediments of breathing and of circulation, may produce defects of apperception which only apparently put the children on the same basis as those whose inborn intelligence is abnormally low.

We have spoken throughout about the psychology of the pupil. A real system of educational psychology ought also to leave room for the psychology of the teacher. The ability to teach, and the ability to estimate the value of the pupil's work, is a mental disposition which depends upon many psychological causes, and which cannot be replaced by mere intellectual interest. The psychotechnics of teaching has only recently been approached by the experiments of the psychological laboratory through studies on the constancy of decision and judgment, on the value of standards for the classification of handwriting or arithmetical work or compositions. It is the least developed part of educational psychology, but the one which may ultimately become the most significant and most valuable aid in the improvement of school life.

CHAPTER XXX

LEGAL PSYCHOLOGY

The Report of the Witness.—While the connections between psychology and education are perfectly established, those between psychology and law are, to a certain degree, still loose and tentative. The contact between the two groups of interests is distinctly felt, and it cannot be otherwise, in view of the evident fact that the legal work refers to criminals, to witnesses, to plaintiffs and defendants, to judges, to juries, in short, everywhere to psychical personalities. Hence the application of the results of scientific psychology to the problems of the court seems logical; and, indeed, it has often been said that a consulting psychologist may be as necessary in many trials as a chemical expert in a poisoning case. Yet everything is still in an experimental stage, and it lies in the nature of the situation that progress cannot be so swift as in the field of education. Any school principal can sanction a new educational scheme, and can try its efficiency, but the individual judge has not the right to make experiments with new methods. The whole mechanism of the court must necessarily work more slowly and in a more conservative spirit. But the interest in the application of exact psychology to the problems of the court is steadily increasing, and at many a point it has begun to influence the actual legal life. A hasty development is certainly not desirable.

We must subdivide the material again under the point of view of the various practical purposes. We may distinguish, accordingly, the purpose of getting evidence from

witnesses, of extracting the truth from the criminal, of improving the judicial activity, of preventing crime, and so on. Each of these problems is linked with a variety of mental functions. We said that we want to separate the examination of the witnesses and the examination of the criminal. But from a psychological point of view the demarcation line ought to be slightly shifted. The fundamental difference between the two groups is that, on the one side we may presuppose the intention to speak the truth, and on the other side to hide the truth. Yet it is, of course, not an infrequent case that the witness intentionally lies, and the criminal is doing his best to bring the truth to light. Our first psychological problem is, accordingly, to criticize the evidence furnished by those who intend to speak the truth.

The reports of the witness are always combinations of objective and subjective factors. Emotions, decisions, thoughts, may influence his account of the past experience, and, even where the interest is entirely devoted to the external stimuli, the subjective apprehension and attention must play a rôle. It is possible that the original sensory perception was defective; or, secondly, that the apprehension at the time of the perception was erroneous. Thirdly, the disposition for the memory images may have changed in the course of time so that a correct reproduction has become impossible. Fourthly, the will to reproduce the memory ideas may not have been intense enough to overcome suggestions or autosuggestions or to secure completeness. Finally, the witness may have lacked the ability to express his ideas correctly. Only if the process were free from disturbances at all these points can the testimony count as an objective report.

Each of these sources of mistakes can be examined by the psychologist. It is clear, however, that three different types of psychological facts must be considered. We must know the general laws of the mind which hold for every

individual; we must, furthermore, know the particular facts which are true for the special group to which the witness belongs; and finally, we must know the mental equation of the particular individual. The first two kinds of knowledge may be gathered from a systematic treatise; the last can be gained only from the direct examination of the special person. We may learn, for instance, the mental laws of suggestion and suggestibility, and apply them to any witness. We may also learn, in a general way, that women are more suggestible than men, and that children are especially suggestible. If the witness is a little girl, we must make full use of this general information. But this cannot relieve us from the duty of examining the special degree of suggestibility of a suspicious witness with all the help of psychological experiments. It is quite possible that in the special case the particular girl may be very slightly suggestible, or may even show traits of negative suggestibility.

The starting point is the original perception. We have to consider here all the data which the psychology of the senses, of perception and apperception, has furnished. It may be sufficient to recall the optical, acoustical and tactual illusions, which refer to the sense qualities and intensities, as well as to their spatial and temporal grouping. It may often be important for the court to know that a time interval appears longer or shorter, according to the different ways of filling it; that observations made through a keyhole demand corrections with regard to size; that colors cannot be recognized in faint light; that the recognition of sound direction is subject to definite illusions. If the witness testifies that he heard a cry in the night in front of him his report has small value; he cannot be sure that the cry was not emitted behind him, as no one can discriminate from which of these two directions a sound comes. These typical facts of mental behavior are shaded by the varying tendencies of perception, of attention, of respon-

siveness to special sense material, of discrimination and of judgment. The good visualizer may have observed carefully the physiognomies and the dress of the persons in a scene he witnesses, but may have given very little attention to the conversation he heard.

Memory and Suggestibility of the Witness.—The most frequent condition for errors is not the faulty apperception at the time of the original experience, but the defective reproduction. The disturbance may begin with influences immediately after the perception. We have discussed before the fact that a severe interference with the inner settling of the memory material may destroy the memory dispositions. The extreme case is that of retroactive amnesia after a blow on the head. The absence of memories which, under natural conditions, would certainly have been kept in mind is therefore to be expected, if immediately after the impressions strong emotional excitements have broken into the mental life. We may even reverse this statement. If testimony contains subtle details concerning an experience which was immediately followed by strong excitement, for instance, observations before an accident, the report of the witness is psychologically suspicious. It is probable that much of it consists of unintentional, imaginary additions.

The studies of memory and of association and the analysis of the relative importance of frequency, recency, vividness and constellation for the reproduction of memory images can be made serviceable at many points. Experiments which were planned to bring the conditions as near as possible to actual life conditions have disclosed a fallibility of the average mental mechanism which the naïve observation had hardly suggested. Artificial dramatic scenes have repeatedly been rehearsed, the various stages photographed, the spoken words written out beforehand, and finally acted in the presence of educated observers, who did not know that the scenes were prepared before

hand. The witnesses believed that they were seeing a spontaneous quarrel, or a chance fight, or the accidental intrusion of strangers. Then they were asked to write out a full report. The results have uniformly been that 25 per cent. to 50 per cent. of the statements were erroneous, and that omissions falsified the results throughout. Even when such a scene was once acted in a meeting of a scientific academy, where jurists, psychologists and physicians of high scientific standing were the witnesses, while the president alone knew that the intrusion was an acted scene, the reports which he requested from all present showed that among forty only one man had forgotten less than 20 per cent. of the acts into which the whole scene could be decomposed, twenty-six missed 20 per cent. to 50 per cent., and thirteen more than 50 per cent. Besides these omissions in twenty-four reports up to 10 per cent. of the statements were inventions, and in a fourth of the reports a far greater per cent. of the memories was directly wrong. The colors of the costumes were described with extreme variations, the time of the intrusion was estimated from a few seconds to many minutes.

Other experiments have demonstrated that it is not even necessary that the witnesses be ignorant of the artificiality of the scene. Theatrical performances, played before educated observers who knew that they were to give a detailed account, were reported by them with the same unsatisfactory results. An experiment in which leading men of affairs took part, and which consisted of a simple scene in a broker's office, played by four persons in a few minutes, showed that not a single one among twenty well-known lawyers and bankers was able to reproduce the impressions with regard to the essential facts. The majority made from 50 per cent. to 60 per cent. omissions of the details, and substituted so many wrong statements that in many of the reports a third of the description was contrary to the facts. The psychological test becomes still simpler, if

pictures of the ordinary picture-book type are shown, and afterward questions as to the number, the color, the form, the position, of the chief objects are asked. The use of this picture material most easily allows manifold variations. We can study with it in the laboratory the differences between an undisturbed written report and a report on the basis of an oral examination, the influence of suggestive questions, the influence of artificially reënforced attention, the influence of the time interval between the seeing of the pictures and the delivery of the testimony, the influences of age, of sex, of vocation and of mental freshness.

The experiments demonstrate, first of all, *the extreme unreliability of the testimony of children, the strong suggestive effect of leading questions, the superiority of an undisturbed, spontaneous report to the testimony on examination*, the untrustworthiness of testimony about everything which was not the object of special attention during the experience, and, finally, *the relatively small value of that reënforcement of attention during the giving of testimony which we expect from the oath*. We may turn to a few details. To begin with the last, it is the common opinion that, where the will to speak the truth exists, the oath forces the attention on the details so strongly that directly wrong statements can be avoided. Experiments have frequently been made in the following form: Pictures were shown, and the subjects afterward made to describe all the details which they had observed. As soon as their report was completed, they were asked to underline those parts of their record on which they would be ready to take an oath. The average result is that the underlined descriptions are distinctly freer from errors and invented details than the not underlined ones, but that, nevertheless, the percentage of mistakes in these reaffirmed statements is only 50 per cent. lower than that of those records which appeared to the witnesses as uncertain. Where about twenty

mistakes slip into an offhand description of a hundred details, we may expect that the witness will be ready to swear to the correctness of a revised statement which still contains about ten definite errors, some of which may refer to important parts of the material.

On the other hand, we can deduce from the psychological experiment on testimony that the spontaneous report concerning experiences will suffer less from the passing of time than we are in the habit of supposing. That which is really well observed during the experience itself is reported after nine days almost as correctly as after three days. Only the details to which little notice was given from the start fade with the passing of time. Very suggestive psychological experiments have been carried on with reference to repeated transmission of reports from one subject to another. They enable us to trace the tendencies in the steadily increasing changes. The accents of the reports become more and more exaggerated, subtle differences disappear, facts are omitted, and blanks are filled with arbitrary inventions. The results throw an interesting light on the evidence based on rumors.

Even the repetition of the testimony by the same observer lowers its value. Experiments indicate that the second report is often less based on the memory of the actual experience than on a mixture of experience and first report. Then the false additions in the first report are likely to be starting points for further illusions. But the laboratory tests show, also, that the ability to give correct reports can be systematically developed. If experiments are carried on in which the subject is required to give exact descriptions, the percentage of correct statements rises steadily. The results suggest that detectives and policemen might be trained in this necessary ability.

As to the influence of questions in the taking of testimony, the experiments demonstrate that the number of details which the memory produces can certainly be increased

by questions, and, in some cases, even doubled. But the correctness and exactitude of the testimony decreases much more rapidly. This is to a certain degree the result of the hardly avoidable suggestive character of some of the questions. This suggestive character of the inquiries can easily be intensified in the experiments. If a picture of a room is shown, in which there are two chairs by the wall, and the child is later asked whether there were three or four chairs, he reports only in exceptional cases that neither three nor four were in the picture.

Experiments make it clear that careful attention to the psychological conditions is needed to avoid every element of suggestion in the first gathering of evidence. But it has, furthermore, come out that suggestibility is not the only cause for wrong testimony. The ambition of the witness to show himself and to boast of his knowledge may affect his evidence. The more a person is ready to express his correct knowledge, the less he is usually able to inhibit untrue answers. Suggestibility is the stronger, the younger the witness. Suggestive questions, which produced 50 per cent. of wrong answers from children of seven, succeeded only in 20 per cent. of the cases with boys of eighteen. The testimony of children before court must thus be protected against suggestion to an especially high degree, and the spontaneous report of a child is always to be preferred to results from questioning. The identification of an individual by a young witness is also entirely unreliable. The suggestion is the more vivid, the more the emotions of the child, vanity, curiosity, ambition, and especially the secret interest in sexual facts, enter into the case. As to sex differences, the best modern experiments indicate that there is no characteristic difference between the testimony of men and of women.

The Discovery of Hidden Ideas.—We distinguished between the statements of those who try to express their ideas frankly and those who try to hide their thoughts

The witness who lies and swears falsely, or the criminal who tries to cover his guilty memories, offers an entirely new set of psychological problems. The results of the psychological laboratory in unveiling the shielded thoughts and emotions are so far much less available for the practice of the court than those which refer to the sincere witness. Nevertheless they form a significant chapter of legal psychology.

Of course, the history of civilization shows at every age efforts to tear secrets from the soul of the defendant. The torture methods of olden times appear impossible in modern law, not only because they violate the moral feeling, but partly also because it is recognized that their psychological effect is uncertain. The pain overwhelms the will toward truth, innocent persons are accused by the tortured, the consciousness becomes confused, and products of imagination are believed; untrue confessions and selfaccusations by innocent persons are too likely to be the by-products of such cruel procedures. It can hardly be denied that, from a psychological standpoint, many modern methods of securing confessions are for the same reasons unfit for the purpose. A long detention before the trial, fatiguing examinations, constantly repeated suggestive questions, and especially threats and willfully applied emotional shocks are likely to produce in mentally weak individuals illusions and errors.

The chances of bringing to light the true ideas of witness or criminal would be much greater, if hypnosis or hypnoid states could be induced. But here we have a typical case of the striking difference between the mere study of the means and the decision concerning the ends. The psychologist would be sure that he could extract from the mind of the defendant the hidden facts on which the trial may hang. Yet, as we have always insisted, it is not his place to judge on the right or wrong of an aim. He can only say that it is possible to reach a certain effect, but whether it

is desirable to reach it, he must leave to entirely different considerations, which lie outside of psychology. The application of hypnotism for the securing of confessions would be psychologically effective, but both for moral and legal reasons impossible. Yet psychologically many methods by which confessions are secured within the limits of law have decidedly the essential traits of a hypnotic influence. The exhaustion from sleepless nights and hunger, the fear of punishment, and the emotion of uncertainty greatly reduce the resistance of the will, and thus create a state of increased suggestibility. If monotonous words, encouraging confidential talks and uniform sense impressions are added, the resistance crumbles, and the controlling idea of the truth discharges itself in confessions.

Experiments of the psychological laboratory suggest that *the truth can be tapped, even where no confession is extracted*. Daily life offers abundant opportunity to observe the unintentional expression of feelings. If we see how a person blushes or becomes pale at the mention of a certain name, how tears enter into the eyes, the subject becomes hesitating and the hand trembles, we take these signs to be indications of an inner excitement. Often we cannot only diagnose an excitement in general, but can clearly recognize the character of the emotion and discriminate fear or hope or shame or grief. A jury would certainly notice it, if the defendant, on being confronted by a certain person, or on hearing certain words, began to cry or to tremble. It is a matter for the courts to decide whether or not it is suitable to substitute the refined methods of the laboratory for these clumsy observations of emotional expression.

Theoretically this is certainly possible. If, for instance, electrodes were put into the hands of the witness, then a galvanometer could easily show on the wall of the courtroom the slightest fluctuation of his emotional mood. Any excitement, far too weak to be noticed by the ordinary ob-

server, influences the sweat glands in the skin, changes by them the resistance to the galvanic current, and makes the needle of the galvanometer move. In a similar way the pneumograph records feeling influences on the respiration. Sphygmographic records of the influence of inner excitement on the pulse can tell with microscopic exactitude what the tears in the eyes or the trembling or the hasty breathing or the stammering speech show superficially. The practical danger of all these methods lies in the difficulty of diagnosing the particular character of the emotion. The mere excitement of the innocent may be wrongly interpreted as an emotion of guilt. Yet it is evident that in frequent situations no confusion would be possible. If among many photographs shown that of a suspected accomplice awakens strong reactions, while the defendant claims never to have seen the man, there is no fear of misinterpretation.

The greatest psychological interest has been connected with a method which makes use of *betraying disturbances in the association processes*. It is a fact that the presence of memories with strong emotional character can deeply influence the associative play of ideas. The usual scheme is to recite a long list of words, and to demand that the suspected defendant react as quickly as possible to each by speaking the first associated word which comes to his mind. Some of the words shouted to the subject stand in definite relation to the criminal action. The decisive symptoms of guilt are first that the association time is prolonged for those words which stir up emotional excitement, and the delay may even occur in the immediately following associations. Furthermore, the associations themselves show traces of the hidden ideas, inasmuch as the emotional memories have the tendency to push themselves into the foreground and to influence the selection of the associated ideas in a suspicious manner. Finally, if the same series of words is later called again, the harmless words awake es-

essentially the same associations as the first time, but, whenever a sore spot of the mind is touched, a change occurs and a new association replaces the old one, even if it were not likely to betray the subject.

A similar method consists in reading to the defendant a report of the facts with certain characteristic blanks. He is requested to repeat this report after some time. If he has a fuller knowledge of the facts and tries to hide it, the details of the report fuse in his consciousness with his more expansive knowledge, and the result is that, when he tries to reproduce the fragments, the hidden parts will come to the surface. The value of these and other methods has often been demonstrated in the laboratory experiments, but they are to-day hardly developed enough to be carried into the courtroom. Even if we abstract from all the legal difficulties, the psychological scheme itself must still be much further elaborated in order to secure a greater protection of the innocent. On the whole this group of methods may to-day render practical service better where the trustworthiness of the witness is to be examined than where the guilt of the defendant is to be decided upon.

The Court and the Criminal.—The psychological interest is certainly not confined to the methods of securing evidence. It may turn on the one side to the study of the legal factors themselves, the mental mechanism of the judge, the jury, the lawyer; and the results may have practical significance. The judge, for instance, has the freedom to determine within certain limits the length of the sentence. Observations and statistics show that this decision is to a high degree dependent upon the psychological preference of the individual judge for particular figures. Years of detention in prison are added simply because the psychological mechanism of the individual judge automatically prefers one or another figure. Experimental tests can trace these tendencies, and a knowledge of them may well

aid a conscientious judge in emancipating himself from these dangerous conditions.

To choose an illustration from the problems of legal institutions, the psychologists have studied the mental effect of discussions on the minds of the jurymen. The psychological experiment in such a case does not introduce complex legal material, but some simple situation on which different opinions may exist, only one of which is correct. If a group of men is asked to form a judgment concerning the number of irregularly placed dots of various sizes on two walls, a hundred to be compared with a hundred and five, they may differ in their judgments which field has more dots. If every one writes down his opinion and then an extensive discussion brings out arguments in favor of the one or the other view, it can be shown that the number of correct judgments increases with the number of votes based on detailed discussion. The frequent argument that the discussion of the jury may suffer from the suggestive influences of those who are wrong is thus contradicted by the psychological experiments.

On the other side the chief demand of the psychologist must be for a thorough psychological understanding of the mind of the criminal. Where the action is the product of insanity, the problem is one of psychiatry and not of law; the paranoiac is not guilty of a crime. But, while his deed falls into the sphere of the physician, numberless shades of decreased responsibility must be discriminated and considered by the judge and the jury. The mind of the entirely normal man may have been deprived of its efficient working power at the time of the deed, as the criminal may have been under the influence of chemical substances, drugs, alcohol, or he may have suffered from unusual emotional excitements or from overfatigue, or he may have been brought into a hypnoid state by monotonous stimuli. Each of these influences, which lower responsibility without excluding it, may have any intensity. Often the psy-

chological experiment may be necessary to clear up the true situation. The mere knowledge of the objective conditions like the number of hours which a locomotive engineer had to work in succession before an accident occurred, or the number of cocktails which the defendant took before his violent deed, does not characterize the situation sufficiently. Everything depends upon the individual disposition and the individual reaction to fatiguing or exciting stimuli.

Not seldom it is asserted in the courtroom that direct hypnotic influence was responsible for the criminal deed. The psychologist must give a warning against the acceptance of such a subterfuge. In the laboratory it is easy enough to perform hypnotic experiments, in which the subject kills his friends with paper daggers, but such experiments do not prove at all that in practical life hypnotic suggestion can induce a morally upright person to commit a crime. While a foolish and even a slightly dangerous action can be forced on the hypnotized person, everything seems to speak against the theory that the resistance of a serious moral character can be broken down by a posthypnotic suggestion. In all those widely discussed experiments a certain dim consciousness of the unreality of the conditions probably remained. Only where the suggestion coincides with the latent criminal intention, it may succeed in breaking down the psychical resistance.

These transitory influences which lower the responsibility at the time of the crime are, however, not so fundamental as the lasting conditions of low mentality. A large fraction of those who fill our prisons stand in the borderland region between mental health and mental debility. Experimental tests have often been applied. They must be carefully arranged in order not to include mental functions which are dependent upon acquired knowledge. Simple acts of memory, of attention, of apprehension, of decision, of emotion, must stand in the center of the research

Where such psychological tests have been made on prisoners and on socially normal persons of the same age and of the same group, the *much lower mental abilities of the criminals* have always become evident. A correct estimation of the crime is possible only if these mental conditions of the particular individual are known. This situation is repeated in civil law. Again we may abstract from real pathological disturbances and yet we must recognize the many shades of ability to dispose of one's property and to make depositions. In questions of contracts and of damage or divorce suits and of legal disputes resulting from a suicide, the psychological facts must be carefully considered. Damage suits, depositions, contracts and last wills, too often involve psychological problems, for which the popular psychology of daily life is entirely inadequate. Memory, intelligence, ability to observe, to apprehend, to resist, degree of suggestibility and of will energy, ought to be determined by experimental tests.

Hence criminal law and civil law alike lead to the urgent question of the establishment of psychological institutes in connection with the courts in which at the request of the court mental examinations of criminals, of witnesses, or of a party in a civil suit, can be carried out with the modern experimental methods. Only on the basis of such systematic psychological studies in the service of the court can a more ideal adjustment of punishment to the criminal personality be hoped for. Every psychologist knows how often the punishment is utterly ineffective, how often it leads even deeper into moral turpitude. The experimental study of the effects of the various forms of punishment on the functions of the mind is only at its beginning. But the problems which demand solution are evident.

Prevention of Crime.—Finally, the services which the scientific psychologist can render to the world of law must include the efforts to prevent crime through psychological

influences. We have just spoken of one necessary step toward this end, the avoidance of penalties which drag the criminal still lower instead of reforming him. Yet even an ideal system of penal laws and penal methods would not be sufficient to reduce crime in the social community to the least possible amount unless other influences are added. The sociological psychologist would first of all indorse the *eugenic demands* which aim toward the elimination of the inefficient minds. The psychologist cannot accept the doctrine which for a while had many followers, the theory of the born criminal. Nobody is necessarily predestined to become a criminal: but we have pointed out before that, according to the experimental tests, the criminals are mostly recruited from those human beings whose minds are in some respects deficient.

The question of deficiency is always related to the social purposes. We do not call an individual deficient because he lacks the ability to paint or to recognize musical intervals, inasmuch as the artistic or the musical talent is not a social requirement. But, if an individual lacks the inhibitory power to suppress an impulse, or cannot produce associations quickly enough, or is disposed to develop emotional ideas so extremely strong that the normal effect of counter-ideas cannot stop them, or if his intelligence is not sufficient to foresee the effects of his actions, his conflict with the social surroundings is inevitable. No one of these defects has a definite relation to crime; each one would reduce the chances of the individual in the struggle for social existence at every point. But the probability is great that among the effects conflicts with the laws will be frequent. The family histories of the descendants of feeble-minded persons show an almost regular mixing of criminals, tramps, idiots, imbeciles, drunkards and epileptics. If the community is to eliminate crime, it must first of all take care that as few psychopathically burdened persons as possible are born. The suppression of marriages between

feeble-minded or otherwise mentally defective persons is accordingly a serious need.

The more direct and more immediate method for the suppression of crime, however, is from the point of view of psychology the exclusion of everything which is a stimulus to crime, or which reënforces the impulse to crime, or which paralyzes the inhibitory mechanisms of the mind. A typical movement of this kind is the effort to reduce the consumption of alcohol and to strengthen the *temperance habits* of the population. The close relations between alcoholism and crime cannot be denied. The influence of alcohol on the threshold for sensory impressions, on the memory, and, above all, on the apprehension and the reaction, make this connection very natural.

To be sure, the reactions become quicker and more vivid, but this is not an increase of efficiency. Its immediate effect is the motor discharge without sufficient selfcontrol. It is this mental reënforcement of the reactions under alcohol which produces the hasty insult or the blow which follows a cutting word like a reflex before the normal inhibition sets in. This lack of inhibition leads to serious crimes, reënforced by the dull apprehension which confuses the whole impression of the situation. The mere prohibition of alcohol is in itself no solution of the psychological problem, as without a complete education to temperance the craving of mankind for excitement leads automatically to substitutes which may be no less dangerous in their social consequences. But the use of strong alcoholic drinks, like whiskey and cocktails, the use of alcohol in any form by persons under twenty years and by anyone whose nervous system is in any way defective must be absolutely suppressed, if the consequences of psychological observation are to be carried out. The effect of cocaine, which is much in use in criminal circles, is, of course, still more dangerous.

The important fight against the misuse of alcohol must not obscure the fact that other social factors push the weak

mind toward crime no less. The dime novel and every form of cheap detective literature and not less the vulgar exhibition of murder trials and divorce suits in the sensational newspapers, are a constant source of mental poisoning. The psychologist cannot too seriously point to the dangers which result from the automatic action of the mechanism for imitation. The laboratory experiment leaves no doubt that imitation is the strongest cause of motor action. It is ultimately the whole atmosphere of the law-violating community which creates the criminal impulse and reduces the inhibitions in the weak mind. Where graft and corruption, indulgence in violations of the law, lack of respect for the law and tardy or partial justice are habitual, the mental soil is prepared in which all the weeds of criminal ideas must grow rankly.

CHAPTER XXXI

ECONOMIC PSYCHOLOGY

Psychotechnics of Commerce and Industry.—It is surprising to see how late the contact between economic interests and scientific psychological studies was established. The industrial world, which strained all energies to make every possible use of the scientific progress in physics or chemistry, entirely ignored until a few years ago the results of scientific psychology. The factories were supplied with the best machines, and the greatest care was taken to keep them at the point of highest efficiency, but nobody seemed to consider that the mind-brain apparatus of the workingman is the most essential element of the plant, and its efficiency the most momentous condition for the commercial output. Psychical functions, moreover, are essential for the economic result, not only in the workingman's case. The manager and the superintendent in the mill, the farmer in the field, the salesman in the store, are mental agencies, which cannot be left out of the calculation of economic results. And finally they all depend upon the purchaser whose mental functions decide upon the value of the offered goods. Every shop window, every advertisement, every label, is an appeal to human minds, and every improvement in the output of factories and mills is made to please some psychical individual.

Since mental life plays such a significant rôle at every point in commerce and industry, it is astonishing, indeed, that the selfish interest of the men of affairs did not lead them to the door of the psychological laboratory. But,

while the application of psychology to the economic problems was postponed unreasonably long, the rhythm of progress in the last few years suggests that the eagerness of the economic circles will quickly make up for the neglected opportunities. The psychotechnics of commerce and industry to-day surely still stands far behind the psychotechnics of education. The literature is still meager and sporadic, in contrast to the extremely expansive writings on pedagogical psychology. But the community has begun to feel that the neglect of the psychical factors which enter into the material of production at a time when the psychological laboratories are prepared for such work is an economic injury to public welfare which demands correction.

The essential need is a development parallel to that in the educational field, and this means that the economic psychotechnics must no longer remain a mere by-product of general psychology. We recognized that the experimental work became valuable in pedagogy, because, after a first period of simply dragging the psychological results into the schoolroom, a second, better period, came, in which psychological studies were carried on in the direct interest of education. In the first period the problems were controlled by a theoretic interest in psychology, and the results were later artificially adjusted to the practical needs. In the second period the problems themselves were formulated under the guidance of educational interests. This is the necessary development in every new field of psychotechnics. In the economic sphere we are only beginning to reach that second stage. Essentially the problems of the merchant and manufacturer must still be solved by a reference to psychological facts which were found through experiments carried on for entirely different purposes. The true need is for scientific psychological studies from the point of view of the economic problem.

The difficulties are certainly incomparably greater than those in the educational field. They begin with the endless

diversity of the practical demands, compared with the far-reaching uniformity of the school work. Every trade, every factory, has its own groups of problems. The psychological conditions which hold for the textile worker are not those of the printer or of the steel worker. It seems doubtful whether the private initiative of the academic laboratories, which has mastered the pedagogical problems, will be able to adjust itself to the endless manifoldness of the economic questions. In the interest of national commerce and industry, governmental research institutions ought to be devoted to these psychological studies in the same way in which, in the interest of the farmer, governmental agricultural stations clear up the chemical or botanical problems. On the other hand, it is only natural that the manufacturer and business man, since their eyes have been opened to the new vista, are anxious to have their private establishments studied and aided by psychologically trained experts. The result is a rapid development of the new profession of the consulting psychologist.

The Selection of the Industrial Worker.—The one psychological problem which seems most significant, and for the solution of which the method of experimental psychology can hardly be replaced by any other, is the mutual adjustment of mental personality and practical work. *The individual needs the place for which his mental dispositions make him fit, and the work demands the individual whose abilities secure his success.* Two independent movements lead to the threshold of this psychological problem. On the one side, the well-known effort of *scientific management* necessarily suggested an increased interest in the mental make-up of the individual worker. The students of scientific management themselves did not undertake any researches in experimental psychology, and were hardly aware of the progress which modern psychology has made in its laboratories. But their work led to the point at which the necessity of a systematic psychological study be-

came evident. Their time-measuring analysis of the components which enter into an industrial achievement and their painstaking motion study, with their persistent search for the man who can perform the prescribed task in the prescribed time, demands as a necessary supplement the experimental investigation of individual mentality.

At the same time the social movement toward *vocational guidance* arose. Boys and girls, on leaving school, were to be advised as to the most appropriate work for them. The methods of experimental psychology were, on the whole, foreign to the vocational counsellors, too, and, where mental states were tested, it did not go beyond a dilettantic approach. The advice was essentially based on demand and supply, wages, health and hygiene, necessary knowledge, but, least of all, on objective mental dispositions. Accordingly, scientific management and vocational guidance alike stopped before the methods of experimental psychology were reached. But both had turned public attention successfully to the fundamental problem of choosing the right economic lifework. They had approached it, to be sure, from two different sides. The scientific manager seeks the best man for the work; the vocational counsellor seeks the best work for the man. *The experimental psychologist combines these interests*, and makes the methods of the psychological laboratory subservient to the question. He is aware how much personal unhappiness results from the steady friction between abilities and demands, and how poorly the work of the world is done, because too few men stand in the place where they might do their best. Everything seems to be a haphazard scattering of boys and girls who rush into chance paths, discovering too late that they are only blind alleys.

A first step toward the recognition of psychological fitness for particular work is a careful inquiry into the sources of greatest satisfaction. This is certainly not enough. A boy may believe that he likes an occupation

very much, and yet may be entirely unfit for it. Some external features may attract his imagination, while the real inner requirements may be hardly known to him, and may offer growing difficulties if he turns that way. Some work for which he is splendidly prepared by his inborn dispositions may appear to him tiresome, or even repellant, as long as he has only a superficial acquaintance with it. Yet for a first orientation even this inquiry into the feeling reactions may give valuable hints. It brings out at least the mental variations, and it is the more helpful the more the individuals examined have come into actual contact with different lines of work. But a careful observation can add many other features, even without any experimental research.

A mental analysis of this kind, for instance, was undertaken at the University of Cincinnati on the feelings of five hundred students in the engineering department. They were engaged in practical work in manufacture, construction and transportation. Their marked characteristics, as they appeared at work, were classified. It was found that a number of men maintained good grades in all school work, but were utter failures at everything which required manual exactitude and vice versa. If a man seeks a place, we ought to know whether his type is that of head efficiency or hand efficiency. Another discrimination referred to the type of men who are settled and the type who are roving. One complains if there is no continuity to the work, and the other if there is not enough variety.

The next line of separation was drawn between the indoor and the outdoor men. Again there are some men who naturally assume responsibility, and others who just as naturally evade it: the directive and the dependent men. Quite distinct from this difference we find that between the original men and the imitative men. The original man is full of suggestions, but may be unable to carry them into effect; the directive man knows how to realize them. A

characteristic difference of men refers to their liking for tasks of large dimensions, or for subtle, fine, intricate occupation. The one may like to build bridges, and the other to repair watches. Some men are easily adaptable, others are selfcentered and remain the same under all circumstances. Some show great accuracy; others inaccuracy, and this is true of manual as well as mental work. Some show rapid, others very slow, mental coördination. Some are deliberate at their work and some impulsive.

The Adjustment by Experimental Methods.—Faithful observation of these and similar mental contrasts would certainly be helpful in leading young people to the right places, or at least in making them avoid the entirely inappropriate work. But it certainly cannot solve the true problem of an exact adjustment, and, if possible, of an adjustment before the work itself is tried and has led to disappointment, dissatisfaction, and failure, by which often the whole career is ruined. A boy may enjoy quite well the idea of being a typesetter in a printing office, and he may show himself industrious in performing the work of the first few months. Yet, after years of training, he may discover that he can never reach the rapidity with which some others set the type, and that he will stay far behind the average in the wage scale. His mental mechanism does not allow him to reach the desirable speed, because his reactions are not quick enough. Then it is too late to change his trade. Exact psychological laboratory measurements in thousandths of a second might have shown his inability before he ever started on the long way, and might have saved years of unsuccessful training.

But, in order to develop such exact methods, it is evidently not enough to devise schemes for the analysis of every elementary mental function, and for the measurement of their particular combinations. The no less essential condition is the resolving of the technical work itself into its component parts from a psychological point of

view. Two functions may be technically quite similar and yet psychologically composed of very different factors. The mere devices for measuring the mental states may be supplied ready-made by the theoretical laboratory of the psychologist. But the psychological analysis of the vocational activities demands direct psychotechnical research.

The efforts of this type are still scattered, and refer to only a few activities. The real factory work has hardly been approached in this way at all. Considering that, under the roof of one factory, even when only one product is manufactured, only watches, or shoes, or incandescent lamps, sometimes thousands of different functions are performed, it is evident that the task is not small. Yet systematic classification will simplify it greatly, if the classification is made from a purely psychological point of view. Not the similarity of the material, but the similarity of the mental situation, is decisive. The external motion studies and time studies of the efficiency engineers will certainly prove to be helpful contributions toward the psychological undertaking.

Such really psychological work has been carried out in a few groups of technical work. Experiments were made to study the fitness of telephone operators for the complex service which presupposes a particular combination of attention, association, memory, discrimination, accuracy of impulse, and general intelligence, besides mental endurance and energy. Thousands spend long periods of training in this difficult work, only to discover that their natural mental disposition does not prepare them for this occupation. Each of those partial functions involved demands experimental examination. The fluctuations of attention were tested by a long-continued crossing out of a letter in printed text; the intelligence by testing the memory for logical associations; the rapidity of mind by measuring the association times, and so on. In this case every-

thing depended upon the resolution of the complex function into its elements.

As a typical case of an entirely different way of approach, the work of the motormen on street railways may be cited. Many simple mental processes enter into that work. Yet the essential ability consists in the power to combine continuous attention with an impulse to quick reaction, and with a certain imagination by which the movements of pedestrians and vehicles are foreseen. It is the lack of this power which leads to the death of hundreds and to the injury of thousands every year. It is of decisive importance to recognize the presence of this mental ability before a man is accepted for such service. From a psychological point of view the need is, of course, not to experiment with real electric cars, or still less, with miniature cars on the laboratory table. The necessary requisite is a situation in which exactly those mental energies are aroused which are characteristic of the electric railway service.

The experiments were, therefore, carried out with an apparatus in which, by the subject's turning a crank, a large variety of black and red figures passed by. These figures were at different distances from a central double line which represented the track. Several complicated relations of those figures had to be noticed on the passing screen, and the arrangement made it possible to discover when they were overlooked. The number of mistakes and the rapidity of the turning of the crank were measured. The experienced motormen felt, in carrying out this experiment, that the mental attitude was indeed quite similar to that of their function on the street. It was possible by this method to find out in a few minutes which men possessed the mental requisites and which did not. One of these two methods will probably be needed for every vocational analysis through psychological experiment. Either the complex function is divided into its parts, whenever these

parts are relatively independent in the active performance, or the situation as a whole is artificially copied on a reduced scale, whenever the success depends upon the special coöperation of all factors. It is evident that many a test will be suitable to cover a variety of vocational activities.

The Apprentice.—While the study of individual fitness for economic work is perhaps the most stimulating problem of economic psychotechnics, other groups of questions seem much nearer to a satisfactory answer, because they can profit more from the results of general psychology and are less dependent upon specific tests. We may start from the problems of *industrial learning and training*. Many of the general studies and of the pedagogical researches on the development of abilities can be directly applied to the questions of the workshop and the factory. The problem is to bring the individual to the greatest possible efficiency. This certainly does not mean simply to whip up the nervous system to more intense effort. The increase of economic achievement by merely spurring the will is ultimately as pernicious for the employer as for the psychically over-fatigued employee.

The chief point is to discover the most effective methods. They may appear more difficult at the beginning than the usual ones, but, as soon as the first learning is completed, the more complex activity which secures the higher output does not offer greater difficulties. Whoever learns type-writing without instruction finds it much easier to strike the keys with his two first fingers only. If he keeps his eyes on the keys, as seems natural to the beginner, he will soon reach a certain speed in writing. On the other hand, those who are obliged by the teacher to use from the start not two, but all ten fingers, and not to look at the keys, will need a much longer time for learning, and will have to fight with much greater difficulties. But, after some time, they will surpass those who stick to the two-finger method, and may soon reach a speed which would not have been

possible with the primitive method. Yet this much more rapid writing will not demand any greater effort. On the contrary, the correct connections have been formed so firmly that the performance is much more automatic and the work, while it is quicker, produces less fatigue.

The essential point for all learning of industrial activities is the acquiring of psychophysical habits by which groups of muscle contractions are consciously or unconsciously organized in the most economic way. The most immediate influence is produced by mere repetition. The movements become more exact and more rapid by being repeated, and the effect can also be found in the symmetrical muscle groups of the other half of the body and in the neighboring muscle groups. Only after long-continued, onesided training the psychophysical energy of the not used half of the body may finally suffer. The most careful studies of the laboratory have been devoted to the learning of simple technical performances like typewriting and telegraphing. The rapidity of transmitting telegrams grows faster and more uniformly than the speed of receiving, but, while the latter rises more slowly and more irregularly, it finally surpasses that of transmitting.

The ability to receive telegrams shows not far from the beginning a characteristic period during which no progress can be noticed, and a similar period occurs at a later stage. In these periods without advance the elementary habits are almost completely formed, but have not become sufficiently automatic. The attention is not yet ready to start habits of a higher order. The apprentice begins correlating single letters and then syllables. Then he stops, because he must learn to master more and more new material, until his telegraphic vocabulary is large enough to make it possible for him to receive every word at one grasp. As soon as this new habit has been made automatic by a training of several months, he can advance to a higher level, on which whole groups of words are perceived as telegraphic units.

After years, and often quite suddenly, a last new asset can be noticed: whole sentences are understood automatically.

Investigations of this kind must be made independent of subjective impressions. Every element of the function must be objectively registered. The studies of the learning of typewriting, for instance, were carried on with a typewriting machine, in which every key had electric connections, and a system of levers registered their movements on the rotating drum of a kymograph. Each striking of a key, each completion of a word or of a sentence, each glance at the copy was recorded in exact time relations. Studies referring to the training of girls in sewing were made with complex devices by which every stitch moved a combination of levers. The objective results then consist not only of the sewing work itself, but of an exact graphic record of every movement of the sewing hand. On the other side, these objective registrations must always be accompanied by thorough introspective observations. The experiments, therefore, can be made only with subjects well trained in psychological selfobservation.

Very few researches of this kind have so far been carried out. Yet this painstaking psychophysical analysis of the development is the only way to discover the best method of acquiring skill for an industrial task. To stick to the traditional schemes of so-called common sense is often most uneconomic. The one method which is ultimately the best is always the only one which ought to be applied from the beginning. But to find it involves indeed the most careful consideration of the repetitions and of the pauses, of the process of imitation and effort, of the exercise in parts of the movements and of the special combinations, of the rhythm of the work and the secondary feeling motives, and of many similar influences which may shape the process of learning.

The Technic.—Another aspect of the psychotechnics

of industry is the adaptation of the technical apparatus to the mental conditions. The whole history of technic, to be sure, is one great record of this adjustment. Mankind has always instinctively tried to change the technical work so that the mental energy could be saved as much as possible. Coördinated motor impulses were preferred, mental interferences were avoided, and especially *rhythmical impulses* were introduced, as they allow a psychophysical setting through which the effect of the mental impulse is strongly increased. Any rhythm involves a repetition of movements without demanding a real repetition of the psychophysical impulse. The first excitement still partly serves for the second and the second for the third. But all these psychological motives were realized only by incessant trials with an immense waste of effort. Real attention was given only to the improvement of the machinery as such, and men merely had to serve the requirements of the most efficient apparatus.

The new movement of psychotechnics aims toward bringing this adjustment consciously into the foreground and toward testing systematically to ascertain what variations best suit the psychological conditions of men. The well-known efforts of the scientific management engineers toward the improvement of the technic of bricklaying and of shoveling, contributed excellent examples of adjusting traditional forms of tools to the psychophysical needs. If everything is lifted with the same shovel, the individual will be exhausted too soon, when the material is too heavy, and will waste his energies, when it is too light. It was necessary to determine the weight which could be lifted with every shoveling movement without overfatigue and without waste of impulse. As soon as this was found to be twenty-one pounds, ten different kinds of shovels could be used for ten different materials—small ones for heavy, large ones for light substances. With this improvement it was possible in large steel works to have

the shoveling on which five hundred laborers had been engaged done by only a hundred and forty, whose wages could be raised by two-thirds.

Yet such practical attempts by scientific management can only blaze the way. The subtler work needs the systematic experiment of the psychological laboratory. Exact studies, on attention, for instance, must settle how the various parts of machinery should be distributed, if the laborer must keep watch for disturbances at various places. Often the adjustment must have individual character. It is a waste of energy for the user of a typewriting machine to select a typewriter which is not attuned to his individual mind. The shift-key machine and the double-keyboard machine, for instance, involve very different mental faculties.

The influence of colors, of sounds, of noises, of tactual impressions, of humidity, of temperature, of odor, of quick changes, of movements, of size and number of stimuli, has hardly been considered as yet from the standpoint of exact psychology. Every experimental investigation along such lines opens wide psychotechnical vistas. The technical work may be deeply affected by the colors of the surroundings, by the character of the signals, by the position during work, by the filling of the pauses, by pleasant or unpleasant distractions, by continuity or interruption. Only the experiment can demonstrate what rhythm of movements is the mentally most economic. It can be shown, for instance, that the greatest exactitude of rhythmical movements demands different rapidity for different actions. Every muscle group has its own optimum of rapidity for the greatest possible accuracy.

Monotony and Fatigue.—The practically most important problem in this field is that of *uniformity of movement*. Everybody who thinks about the needs of our time is impressed by the evil of *monotony*, which seems so unavoidable in our modern industry. Much of our social

unrest is the direct result of the widespread denunciation of this economic wrong. Yet the whole social-ethical attitude is based on general impressions, and not on exact studies of the mental processes which enter into uniform work. Uniformity of work appears to us as monotony after all, only when we dislike it. The psychologist must examine whether this dislike is necessary, or whether it is not simply a prejudice. Since the attention of the scientist has been directed to this much misunderstood feature of industrial work, the results strongly suggest that the popular idea, which is recklessly hammered into the minds of the masses, is fundamentally wrong. Uniformity is disagreeable to some minds and agreeable to others.

The laboratory experiment leaves no doubt that there are fundamental differences in this respect among individuals of every group. The complaint of monotony is therefore not confined to the workingmen, but can be heard from men and women of all vocational groups, if they are temperamentally averse to uniformity, which cannot be excluded from any field of work. But, as many other men and women gain satisfaction from the same kind of work, because uniformity is in harmony with their mental tendencies, the workingman, too, when he is not in the power of artificial theories, may enjoy the regular repetition of his activity more than any variety. Some minds exhaust their energy for a particular function in carrying it out once, and therefore prefer change. If they are forced to repeat the first action it needs a steadily growing effort which becomes intolerable. But there are others with whom going through the action once produces a setting which prepares for the repetition, and makes it more natural, more pleasant. Any friction is reduced, and the uniformity is most welcome. In every walk of life some are inclined toward innovations and others toward continuity. The one mental tendency is not better than the other, any more than a visual memory

is better than an acoustical memory. Desire for change and loyalty to tradition are equally important for human civilization.

The question of monotony must be cleanly separated from that of *fatigue*. Fatigue is unpleasant under any circumstances, but it may result from the work full of changes, as well as from the uniform work. No psychological factor demands such careful study in the interest of the workingman, as well as in that of the employer. The various kinds of fatigue and exhaustion, the conditions of restoration, the pauses at work, and the speed of work in its relation to fatigue, offer an abundance of problems of which only a few have been studied experimentally so far. The laboratory experiments have been essentially confined to the fatigue from mental labor. They have successfully shown the great individual differences of exhaustibility, of ability to recover the lost energy, of ability to learn from practice, and so on. But corresponding experiments on the individual differences of fatigue and restoration after physical work hardly exist as yet. The practical studies in the service of scientific management, however, have clearly demonstrated that a careful adjustment of pauses to the different kinds of physical work can lead to an increase of output far beyond that secured by any enforcing of more work by artificially whipping up the mind with promises of extraordinary wages.

It was found, for instance, when the work of the pig iron handlers was examined that their maximum efficiency for the usual loads of ninety pounds was secured when they were not allowed to work more than 43 per cent. of the working day, being entirely without load 57 per cent. Under such regulation the men who were ordinarily unable to carry more than twelve tons a day were able to carry forty-seven tons without greater fatigue. As far as the fatigue depends upon the length of the working

time the changes in the factories had themselves experimental character. It was recognized that a decrease of the working day from ten to nine hours did not involve a loss, as the mental efficiency in each of the nine hours proved so much greater than in the exhausting ten-hour day.

A very significant account of the changing conditions of fatigue during the working day can be gathered from the official statistics of accidents, which are distributed with an uncanny regularity. Yet they show that the lack of attention which finds its expression in the increase of accidents is not the product of fatigue alone. The last hour of the working day is not the one in which the greatest number of accidents occur. The feeling of the approaching end restores the energies. The whole interplay of factors which influence in this way the attention of the workingman, for instance, the influences of conversation, music, noises, alcohol, coffee, tea, tobacco, wage premiums, evening entertainments, home dreariness, outside activities and reading, are strictly psychological problems, which have hardly been approached with the means of science. The neglect of a systematic study of these fundamental conditions for economic success, which is at the same time a social and national success, stands in regrettable contrast to the earnestness with which the methods of physics and chemistry are applied for the technical part of industrial life. The psychotechnical questions are simply answered by common sense, which too often means misleading prejudice and unwise tradition, resulting from a chance development which may have grown up under entirely different conditions.

The Interests of Commerce.—If the word commerce may designate for us the whole realm in which buying and selling turn the social wheels, the world of commerce is surely a sphere of mental activity. The marketable objects of commerce, their production, their distribution,

their relative values may be described from the point of view of the economist, or the sociologist, or the geographer, or the naturalist, but ultimately everything hinges on the subjective interests and needs of the buyer and seller. Thus the psychologist stands nearest to the essential factors in commerce, and psychotechnical advice is needed. The fact that very little attention has been given to the mental elements involved is probably to a high degree responsible for the often observed contrast between commerce and industry. While the industrial life, in which machinery is so prominent, was forced by the progress of natural science into entirely new molds during the last century, commercial life has remained practically unchanged in its principles. Only in most recent times a conscious study of psychological conditions has begun to bring method and system into much which had been left to a haphazard development.

The *psychology of advertising* may be referred to as a clean illustration of the detailed experimental work which can be devoted to such problems of commerce. A large number of careful experimental investigations on the question of how printed advertisements influence the mind of the reader have been carried out in the psychological laboratory, and have begun to shape the practical endeavors. Measured by the amount of expenditure, advertising has become one of the largest industries of the world. Each advertisement is an instrument constructed to produce certain mental effects. It is to draw the attention, to awake the interest, to impress the memory, to arouse an impulse. For every one of these mental influences certain general statements might be deduced from the routine psychology of human suggestion, attention, and so on. But really satisfactory conclusions will be possible only if the specific problems of the advertiser determine the experimental study.

We may well foresee that a large advertisement will

draw the attention better than a small one, that a vivid and intensely colored poster will attract it more than a dull one, that an often repeated announcement will force itself on memory better than a single one, that a picture with dramatic interest will have more suggestive power than mere text. Yet, as soon as the business man has to consider whether he will have a full-page advertisement once, rather than a quarter-page advertisement four times in the same paper, or perhaps in four different papers, such general conclusions cannot help him. He needs definite advice, which only the psychologist can furnish him. Psychologists found, for instance, that when fifty persons in ten minutes looked over a book of a hundred pages of advertisements, and were asked to write down what they remembered, every full-page advertisement was mentioned on an average of six and one-half times; every half-page less than three times; every quarter-page about one time, and the still smaller advertisements only about one-seventh of a time. The memory value of the quarter-page thus appears much smaller than one-quarter that of the full-page advertisement, and that of the one-eighth page again much smaller than one-half the value of the quarter-page. The customer who pays for one-eighth of a page receives not the eighth part, but hardly the twentieth part of the psychical influence which is produced by a full page.

On the other hand, when the books were prepared in such a way that full-page advertisements occurred only once, half-page advertisements twice, quarter-page advertisements four times, eighth-page eight times and each of the twelfth-page size twelve times, and every page was looked at for twenty seconds, it was found that the four times repeated fourth-page advertisement has a $1\frac{1}{2}$ times stronger memory value than one offering of a full page or the twice repeated half page. But the eight times repeated eighth of a page is somewhat weaker than the four time repeated quarter page. Here nothing depends upon the

special figures, which refer in part to special conditions. The essential point is the possibility of applying exact experimental methods by which the relative mental influence of various advertisements can be measured as well as the relative physical power of two electric lights. Experiments demonstrate that the right side of the page has more influence than the left, the upper more than the lower half, the outside more than the inside. The advertiser who pays for the right upper quarter as much as for the left lower quarter of the right page receives more than double the mental value.

The advertisements which are mixed with reading matter on the same page have a much weaker influence on the memory than those which are on pages exclusively devoted to advertising. The different attitudes which the mind takes toward text and toward advertisement interfere with each other, and do not allow to either the greatest mental effectiveness. The importance of borders, contrast effects, drawings, can be easily discriminated through such studies, and from these formal conditions the exact inquiry can well proceed to the more complex and internal qualities of the means of propaganda. The effect of novelty or of the comic, of suggested activity and of appeals to instincts and emotions, or rhyme and rhythm, can be traced. When experiments were carried on with advertising matter in which cuts and reading always filled an equal space and the subjects later had to recognize twenty-five such advertisements among ninety, in which sometimes the text, sometimes the cuts were changed, the results were as follows: The change in the cut was most frequently detected, but the cards with changed cuts are remembered by the text more often than the cards with changed text are remembered by the cut. The cut has, accordingly, greater attention value, but the text has higher memory value.

The psychologist can even grade the suggestive values of

the various means of appeal. But experiments of this kind at once introduce the reference to different groups, different sex, different layers of society. When a large number of advertisements with typical appeals to different interests and emotions were grouped in the order of their relative persuasiveness, the appeal to the desire for saving of time for the women took the lowest place, but for the men the 10th from the lowest place among thirty. The appeal to appetite stood as high as the 8th place for the women, but only in the 3rd place for the men. The greatest difference was in the appeal to sympathy, which took the 23rd place for women and only the 7th for men. The next great difference was the warning against substitutes, which reached the 28th position with men and only the 14th with women. Appeals to clan feeling, to social superiority, to the preference for the imported, to the desire for personal beauty and to the belief in recommendations from famous persons stood in the highest part of the list for both sexes.

The advertisement presents the simplest form of the commercial problem. We have a more complex group of mental functions involved in the case of the actual *display* in a shop window, a store or an exhibition. The details of color and form, of size and quantity, lead to questions which must be settled by new experiments, very different from those referring to advertisements. Even the appeal to the desire to save money or energy, to satisfy the personal or the social vanity, must here take a very different turn, as the real, plastic object has a characteristically different effect on the mind. The effect of movements, with their suggestive power over the impulse to imitate, must be studied. An especially interesting task is to find the limits within which the object displayed may be beautiful and yet serve as a starting point for the will to act; beauty in itself means inhibition of the practical impulse. Only through the psychological experiment can we deter-

mine in what combination some objects in a window will give the impression of the greatest number, or what background will make them appear more impressive or more dainty. These questions of display lead to those of labels and packings, and finally of the entire outer appearance of the marketable wares.

At the next step we find not the advertisement and not the objects to be sold only, but the salesman himself. He too has to turn the attention of the customer to different points, to awaken a vivid, favorable impression, to emphasize advantages, to influence the will decision, either by convincing arguments or by persuasion and suggestion. In either case the point is to strengthen the impulse to buy and to suppress the opposing ideas. Yet everyone of these factors, when it starts from a man and not from a thing, changes its form. The influence is directed toward a smaller number of persons and thus gains the possibility of individualization. Above all, the personal agent has the possibility of developing the whole process through a series of stages so that the attention slowly becomes focused on one definite point. Every partial function of the salesman can be the starting point for experiments, and only through such a methodological study can the haphazard proceedings of the commercial world be transformed into really economic schemes.

So far the enormous social interplay of energies which are discharged in the selling and buying of the millions becomes rather planless as soon as salesman and customer come in contact. The economic processes are carried out with superfluous and interfering associations and reactions which involve a tremendous waste of energy. The single individual can never find the ideal form by mere instinct. A systematic investigation is needed to determine the way to the greatest saving of mental energy and the result ought to be made a binding rule for every apprentice. The psychological interest, finally, leads from the indi-

vidual seller to the organization of the whole business enterprise. The commercial administrator will need the results of psychological tests as much as the manufacturer in order to find the best man for every vacant place. The personal equation, the particular abilities, the individual shades of memory and attention and imagination and will, must be known in order to foresee whether this man or this woman will be most successful for this particular demand. Even for the highest positions man and work must be adjusted to each other. Ten college graduates led by haphazard methods into ten higher business positions may be inefficient and unsuccessful. If each of the positions had been analyzed into its psychological components, and each of the ten men had been studied by experimental psychological tests, it might have been possible to place every one where he would have been a marked success.

CHAPTER XXXII

MEDICAL PSYCHOLOGY

The Practical Standpoint.—The study of the disturbances of health stands in so many relations to psychology that we must, first of all, exclude everything which does not really belong to the psychotechnical tasks. The psychotechnical interest is confined in medicine as in every other sphere to the problems of practical service. Hence we are not concerned with the help which psychology offers for the theoretical understanding of mental diseases, unless such an explanation aids the diagnosis or prognosis or therapy. On the other hand, the observation of pathological disturbances has become in our time most helpful for the understanding of the normal mental life. The studies of the clinic have been starting points for promising psychological research. Thus we have a significant mutual stimulation, and perhaps the largest part of the psychomedical discussions of our day are controlled by these theoretical aspects. We abstract from all these, and ask only in what way psychology can serve the practical physician.

This limitation of our task makes us at the same time free from academic quarrels on disputed theoretical problems. One such debatable claim threatens above all to disturb the circles of the medical theorists and to deprive psychology of its best usefulness. It is the problem of the *subconscious*. We have steadily eliminated the idea of unconscious mental states and have explained the reasons why we must deny it on principle, if consistent psycho-

logical explanation is sought. We recognized physiological brain processes as the agencies through which the effects in consciousness must be explained. A large party of physicians take the opposite stand. They find that mental diseases like hysteria or psychasthenia with all their complex mental symptoms must sometimes be explained as results of earlier emotional experiences. It seems to them the most natural way to describe the process as a subconscious engagement of the mind with those earlier excitements which have long disappeared from consciousness.

The theorist would have no difficulty in reducing such cases also to a purely physiological explanation. Yet he would readily acknowledge that it is much simpler to refer to these mental fears and anxieties and passions of the past in the terms of mental life than in the language of brain anatomy and physiology. The decisive point for us, however, is that this whole difference of interpretation has not the slightest bearing on the practical usefulness of the psychological insight. If we link the present hysteric attack with a forgotten love excitement in the girl's youth, it cannot make any difference whether we fancy that the after-effect of that shock of passion has lingered in the neurons of the brain or at the bottom of a subconscious mind. Both the diagnosis and the therapy remain exactly the same.

If our treatment consists in bringing those ghosts of the past to the consciousness of the patient, it is indifferent whether we think that we liberate a suppressed subconscious emotion of the mind or whether we recognize that we reawake certain nervous processes. Also when the psychotherapist works by suggestion, he may imagine that he is appealing to the subconscious mind, where the consistent theorist would prefer to say that he is arousing certain brain processes. But however important such a difference may be for theory's sake, the treatment itself

is the same. We may accordingly disregard the whole dispute over the subconscious.

Diagnosis of Physical Disturbances.—The first practical aim of the physician is to recognize the character of a disease. The right diagnosis must precede any prognosis and any therapy. Psychological knowledge may become serviceable for two ends: the physician may use psychological methods to diagnose both physical and psychical disturbances. To be sure, the contrast between mental and physical disturbances does not mean that a mental disease like hysteria can be conceived without illness of the physical body. Every mental disease is ultimately a disease of the brain. But the diagnostic interest may be concentrated on the mental side. When the physician uses psychological methods in testing diseased intelligence, his aim is the diagnosis of a psychical disturbance and not of a pathological brain process.

The examination of physical diseases by psychological methods is needed always when the physician is dependent upon the subjective testimony of the patient. He may observe disturbances of the motor nerves from without, but when the sensory system is diseased, the expression of psychical experience becomes essential. The oculist who diagnoses astigmatism or various inefficiencies of the retina, defects of color seeing, limitations of the visual field, decreased acuity of seeing, double images or wrong projections must examine visual experiences of the patient. When the ear is diseased, the physician studies the limits of tone sensations or the gaps in the tone series or the acuity of hearing. Still more important for the diagnosis of physical disturbances are the sensations from the skin. Nervous disturbances in the sphere of the peripheral nerves, of the spinal cord and of the brain centers may be examined by tactual stimuli. The physician may recognize a diseased condition of the spinal cord by studying whether the tactual impression and the pain impression

caused by a pin prick reach consciousness at the same time or one after the other.

But even when the motor system is involved, the diagnosis demands a reference to the mental impulses. The patient must give an account of his will intentions, if the lack of coördination or involuntary movements characteristic of diseases of the brain or of the spinal cord are clearly to be recognized. This leads to the disturbances of speaking, reading, writing or singing, which point to localized lesions in the central nervous system. The physician must find out whether the patient is still able to repeat words which he hears, whether he can still read aloud and understand words spoken to him, whether he can read something written, whether his voluntary speech has suffered, and many other possible variations of aphasia. By such psychological observations the neurologist recognizes whether the disturbance is in the motor or in the sensory centers of the hemispheres or whether lower nerve paths are diseased.

Diagnosis of Mental Disturbances.—When the diagnosis does not refer to the lesions of the nervous system, but to the mental states themselves, the methods of experimental psychology stand in the foreground. Yet their application is frequently limited by the inability of the patient to adjust himself to the subtle conditions of the experiment or even to understand its requirements. The cruder methods of mere conversation with the patient or of observation of his behavior must then be substituted. Every single mental function may become important for the diagnosis. The first step may be the testing of the *ability to apperceive* the outer world. Disturbance of this function can reach any degree, from a slight confusion and superficial mental numbness to a complete psychical destruction in the demented state. A typical method used in the psychiatric clinics is based on a series of pictures in which the same object, a church or a windmill or a

cannon, is drawn with more and more details. The first drawing gives merely a slight suggestion, the last of the series the completed picture. The question is at which stage of this outline drawing the patient will apprehend the meaning of the lines. In other methods the physician makes use of the tachistoscope to examine how many words can be correctly recognized when they are offered in a quick rhythm. Or, sentences are read in order to examine the breadth and depth of apprehension. The weakened ability must always be compared with standardized average functions.

The laboratory methods are even more useful for examination of the *association* process. If words are spoken to which the patient has to respond as quickly as possible with some other words, very characteristic delays of the process can be noticed. Deep inhibitory changes can thus be traced in exact detail. But it is no less important to study the qualitative character of the associations. Certain diseases are characterized by the preference for external associations, mere similarities of sound or habitual word connections. In other forms of illness egocentric responses in which the patient associates everything with his own personality are diagnostically important. A standard list of a hundred words tried with a hundred normal persons may be used for comparison in order to discover quickly abnormal variations in the percentage of the different classes of associations. In certain disturbances it may be decisive that the patient is not able to perform the task. The words called to him remain in consciousness and do not produce reactions, or words are spoken which have no relation at all to the given words.

This leads to the diagnostically most important examination of *memory*. It is not enough to know whether the memory in general is still good or has suffered, and whether the defects refer to recent or to older experiences. The exact diagnosis demands all the psychotechnical details

which the development of the memory studies in the psychological laboratory can furnish. The ability to retain must be distinguished from that to recall, the mechanical memory from the logical, the optical from the acoustical, the memory for words from that for colors or for persons, the quantity of the reproduced material from the exactitude of the reproduction, the recognition from the free reproduction, the immediate from the postponed rendering and so on. But not every ordinary method of the laboratory can be carried into the clinics. While the psychologist prefers to study the laws of memory by learning meaningless syllables, the memory studies in the hospital must be based on words or pictures as the syllables may not sufficiently hold the attention. The physician knows that in dementia senilis the patients can render the content of sentences correctly but are unable to keep the exact order of the words in their minds. Moreover they add new ideas to the original material. In dementia paralytica the newly acquired material for reproduction disappears with abnormal rapidity. The repetition therefore brings small improvement and words are mixed in which stand in no relation to the reproduced series.

The pathological variations of the *attention* may be traced by demanding simple reactions on certain stimuli. The patient is asked to mark as quickly as possible all the letters r on a printed page or to make a hand movement whenever a certain word occurs in a story which is read to him. Other experiments indicate how many letters or words can be grasped by one act of attention when they are shown for a definite fraction of a second or how many details in a picture are recognized. A significant form of attention study refers to the influence of artificial distractions. Especially the diagnosis of paralysis demands an exact testing of attention. From here we may turn to the examination of *intelligence*. We spoke of tests for this function when we reviewed the application

of psychology to education. The physician usually prefers methods like the following. Three words are given and the patient has to form sentences in which these words occur, or sentences are shown in which some letters or syllables are lacking and the patient fills in the blanks, or two objects are mentioned and he has to define the difference, or he has to explain the meaning of a proverb, or in a series of statements he has to separate the reasonable ones from the absurd ones.

In studying the *will* activities the simplest tests on defective minds refer to the rapidity, exactitude and energy of movements. They register rapid rhythmical movements, measure the time for the quickest possible sorting of cards, the exactitude with which the patient can grasp for an object with closed eyes or with which he can throw a ball into a hole. Subtler investigations require the ergograph through which a graphic record of a continuous series of hand movements can be made. In the case of the melancholic patient, for instance, the original strong movement becomes after a few repetitions very weak but then remains constant for a long while. On the other hand, in the case of the katatonic patient, only a small number of contractions can be performed, though those few remain equally strong. In other forms of experiments the details of speech movements and writing movements are analyzed. The rapidity and exactitude of eye movements too are of high diagnostic value. The decreasing ability of the eyes to follow a swinging pendulum may indicate dementia precox. Changes in the rapidity of reaction may be symptomatic of the maniac depressive states.

The experimental methods which we have discussed refer only to actual processes in the consciousness of the patient, but the experimental schemes of the laboratory may be helpful also when the aim of the diagnosis is to find non-conscious after-effects of earlier emotional experiences.

This is claimed to be essential for many neurasthenic and psychasthenic forms of illness for which anxiety feelings and abnormal inhibitions, such as the fear to pass an open place or to handle a knife or to be in a crowd, are characteristic. Association experiments may throw most direct light on these non-conscious mental derangements. As soon as a word touches on the suppressed memories, the association time becomes longer and by the use of the galvanometric method the emotional effects of touching the sore spot may be revealed. Yet this situation is sharply to be separated from that which we discussed in relation to legal psychology. There these methods were used to unveil the ideas which the criminal hides intentionally. Here they are in use to bring to light memory ideas which are entirely outside of the knowledge of the patient and which his own efforts cannot reach.

Another psychological method frequently used for this purpose consists in asking the subject to allow his imagination to wander and then, often for hours, to speak everything which happens to come to his head. Absurd fragments of sentences, nonsensical ideas, may appear at the surface, but the physician may slowly recognize in them the effects of certain suppressed emotions and memories, and he may be able to trace this material back to definite sources which were responsible for the disease. A similar aid to the diagnosis is expected by many from the analysis of the dreams of the patients, which are then interpreted as involuntary realizations of the suppressed emotional desires. This last group of diagnostic methods, especially the association schemes and the dream interpretation for the finding of suppressed memories, is usually called psychoanalysis. Its value is still much in doubt, while all those other psychological methods with which the physician examines the nervous or psychical disturbances are no longer objects of debate. They have become the indispensable schemes of scientific diagnosis.

The Effect of Drugs.—From the recognition of the disease we turn to its treatment. One group of studies may be considered as introductory. Psychological experiments may serve to determine exactly the effects of different therapeutic agencies, especially of chemicals like the bromides, the opiates, quinine, ether, caffeine, and many other substances which play a rôle in the scientific treatment of diseases. Their effects on the memory, attention, volition and emotion of normal men must be studied in order to foresee the influences which they may exert on the patient. If the epileptic is treated with bromides, the psychological experiment can disclose how far it is true that bromide has influence on the memory functions.

With the same type of experiments the physician may trace in many cases the actual effects of his curative efforts. Mentally retarded children may be treated for their anemia or astigmatism or deafness of adenoids, and subtle experimental tests of their attention, memory, feeling and thought may demonstrate whether the treatment has really removed the cause of the defectiveness or whether an in-born mental deficiency was responsible for the retardation. Even the influence of baths, rest, electric treatment, change of climate and many similar therapeutic influences can be followed up by examining with exact experimental means the changes in the mental functions. The inhibition of thought, the uncertainty of action, the excitability, the dullness of apprehension, ought not to be measured only by the general impressions of the physician or by the vague selfobservation of the patient. Both may be illusory and unreliable.

Psychotherapy.—The center of therapeutic psychotechnics lies, of course, where mental processes themselves are employed to overcome the disturbances. Here we have true psychotherapy. For it the experimental methods of the laboratory are of small importance, but the general

psychological ideas concerning attention, association, setting of will and of emotion must lead the psychotherapist at every step. A great variety of methods is at his disposal. Their common field of work is the wide borderland between health and mental disease, while the mental diseases in the narrower sense of the word are inaccessible to the psychotherapeutic influence. In that borderland, on the other hand, in which neurasthenic, psychasthenic and hysteric states are especially important, the psychotherapeutic methods are indispensable. To be sure, they allow still less rigid rules than other schemes of therapy. Everything must be individualized. Here so much depends upon the personality of the physician that most neurologists have preference for one or another method with which they succeed best. This may easily take a negative form. One physician may exclude the typical hypnosis from his nervous clinic, another may distrust methods of mere explanation or persuasion, one may consider the psychoanalytic methods a grave mistake, another may not believe in autosuggestion or in reëducation; but no nerve physician can entirely disregard the efforts to overcome psychical disturbances by psychical means.

The method which stands nearest to ordinary conversation is that of influencing the patient *by reasonable explanation*. To dispute by argument with a paranoiac and to try to convince the insane would be without any success; but it is entirely different with the mental states of the psychasthenic who is disturbed by unfounded anxieties or by irritating obsessions. The physician explains to him how it all came up, how his symptoms resulted merely from autosuggestion or are after-effects of emotional disturbances. That opens a new aspect to the patient and the deeper insight into his suffering may have an inhibitory influence on the mental intrusion. Yet such arguing can hardly exclude an element of suggestion. Then the influence takes the form of *persuasion*. But the per-

suasive idea is not to influence the mind only by its own meaning and its associations, but by the manner of its presentation, by its impressiveness, by the authority, by the warmth of the voice, by the sympathy which stands behind it, by the attractiveness with which it is offered. This persuasion depends on personal powers to secure conviction where the argument itself might be insufficient to overcome the contradictions.

Very similar is the psychotherapeutic effect of a formal *assurance*. The psychotherapist assures the patient that he will sleep the next night or that he will be able to walk, with such firmness that the counter-idea is undermined. Another excellent way to overpower a troublesome idea or impulse or emotion is to *reënforce the opposite idea* by breaking open the paths for its motor expression. The effort to hold the antagonistic idea before consciousness may be unsuccessful so long as it is without motor effect. But if the action has been repeatedly gone through, the idea will develop more easily, and it becomes vivid in proportion to the openness of the channels of motor discharge.

This holds true even of emotional states. A certain word, perhaps picked up by the psychasthenic in a particular experience, may produce a shock or a depressing effect whenever it is heard. If we ask the patient artificially to go through the movements which express joy and hilarity and speak the dreaded word at the height of the movements, a new feeling combination clusters about the sound and may overcome the antagonism. Or the physician may choose the form of a sharp order which breaks down the resistance just by its suddenness and loudness, perhaps supported by a quick arm movement which gives the cue for the inhibitive reflexes. Often it is wise to give the suggestion not from without but to prescribe it in the form of autosuggestions. The patient is to speak to himself in an audible voice every morning and

every evening, saying that he will now overcome a certain fixed idea or that he will now produce a certain inhibited impulse. Sometimes it is essential to give the suggestion with avoidance of any emphasis, only as a hint, as if the suggestion almost slipped from the tongue of the doctor.

We have presupposed so far that the mind in which the suggestion works remains in its natural state. Under this condition the effect is very unequal with different personalities. To strengthen it, it is important to *heighten the suggestibility*. It must be acknowledged that these methods of emphasis and order, of assurance and make-believe, of persuasion and even of reasoning probably always gain a certain part of their success by the increased suggestibility which the whole situation carries with it. The psychophysical readiness for suggestions grows, indeed, with the expectation of the unknown and of the halfway mysterious and with the confidence in the doctor. Yet skillful artificial means can still surpass the effect of these natural conditions. If the physician's hand rests quietly on the forehead of the patient, who lies with closed eyes, he may secure a nervous repose and submission which gives to the suggestions the most fertile soil.

Again a psychologically different effect results from mild stroking movements. The slow changes of the tactual sensations evidently produce a rather strong influence on the equilibrium of nervous impulses, and vasomotor reflexes seem to arise easily. A certain monotony of speaking may add to the suggestibility. Another most fruitful source of this change is any emotional state of mind in which the individual feels himself in contact with something higher or stronger. The patient who can touch the relics of the saints or bathe in the water of Lourdes is led up to a state of suggestibility which makes suggestions readily effective. The objective religious value has nothing to do with it, as exactly the same effect may result from

barbarous superstition. The amulets of a gypsy may secure the same resetting of the psychophysical system which the most sacred symbols awaken, and even many an educated person feels unable to cross the threshold of a palmist or astrologist or to attend a performance of a spiritist without feeling an uncanny mental state which is objectively characterized by an increase of suggestibility.

If this increase of suggestibility is carried to an extreme, we call it *hypnotism*. Yet the effectiveness of the suggestions is not necessarily greater in such an unnatural state. Sometimes well-applied suggestions work on wide-awake persons with increased suggestibility more strongly than on hypnotized subjects. But in general the stronger hypnoid states are especially favorable for the removal of obsessions and phobias and for the reënforcement of desirable impulses and emotions. The best method of hypnotizing is the one which relies essentially on the spoken word awakening through speech the idea of the approach of sleep. Only a small part of the therapeutic usefulness is secured during the hypnotic state itself. A pain may be removed, an idea inhibited, a movement secured, in cases where non-hypnotic suggestions would have found too great obstacles.

During the hypnosis the physician may also open the storehouse of the patient's memory and bring to light the ideas which disturbed his equilibrium. In the most complex hysteric cases of dissociated personality new memory connections may be formed during the hypnotic state by which a synthesis of the double or triple personalities into the old one may be secured. Yet the best effect which the physician may hope for from hypnotic treatment is the *posthypnotic* one. Not what happens during the sleep, but what the suggestion will produce afterward is essential. The fixed idea is to disappear forever, the apparently paralyzed limb is to be under control, the desire for morphine and cocaine is never to return. To be sure, the

treatment often must be a prolonged one, if a perverse longing is really to be eliminated.

Finally we may refer to the removal of the after-effects of emotional excitements. We have spoken of the *psycho-analytic* method of diagnosis by which suppressed emotions are discovered. The theory claims that these emotions became disastrous to the individual and caused hysteric disturbances and psychasthenic obsessions because they had no chance at the time of their first arising to be discharged in the normal way. It has been found that these pathological symptoms often disappear as soon as those detached emotions are brought to consciousness again and the normal discharge can set in. The twisting of the psychophysical connections is then straightened out again. The psychotherapeutic effort of the physician is accordingly directed toward finding the original source of the shock and bringing it to clear waking consciousness. It is needless to say that the use of any one of these psychotherapeutic methods, notably of any hypnotic method, must absolutely be confined to the well-trained, scientific physician. He alone should employ hypnotism, just as he alone uses the morphine syringe. To produce hypnotic states for experiment's sake is most inadvisable, as it is surrounded with dangers even if we abstract from the moral issues. To play with hypnotism as a parlor trick is a crime.

Prevention of Disease.—The discussion of criminal psychology led us naturally to the problem of the prevention of crime. The discussion of medical psychology must close with the problem of the prevention of disease. The first thought of the criminologist turns hopefully to the new endeavors of *eugenics*. We emphasized that the criminals are recruited from the mentally inferior and that society can reduce their army by suppressing the marriage of the mentally defective. The first thought of the physician moves along parallel lines. He finds the mental disturbances and weaknesses to an alarming degree

the product of inheritance and he cannot help feeling that an effort to reduce the hereditary deficiencies is one of the sacred causes of mankind.

Until only recently such a task seemed vague and beyond the powers of the scientist, as the hereditary connections appeared capricious and utterly outside of exact calculation. But in our day the science of heredity has grown into one of the most exact parts of natural science with mathematical biometric laws based at first on botanical, later on zoölogical statistical observations and nowadays demonstrated by much human statistical material. The point which is essential for us is that deficiency of psychological powers is one of those human traits for which the conditions of inheritance can be measured scientifically. If the mental health of the parents and grandparents of a man and a woman are known, it may be foreseen what percentage of their children will be mentally normal or abnormal. The eugenic efforts must therefore find sympathy among the medical psychologists, provided that they are kept within narrow limits. These limits are certainly overstepped when not a real mental deficiency but only a neurasthenic or psychasthenic disturbance is taken as cause for social interference. Moreover, there is always a danger of substituting physical standards for mental ones and of forgetting that the physical cripple may be a highly valuable member of the social community. And, finally, the negative influences for the suppression of deficiency can too easily turn aside the social attention from the more important positive problem of bringing every germ of mental ability to highest development. It has rightly been claimed that the gain which a great thinker or any genius brings to society is, after all, greater than the loss which results from ten thousand inferior minds which perish after a useless life.

Yet the care that defective minds shall not be born is only preparatory for the chief social duty of preventing

the development of psychical deficiency during lifetime. It is often asserted that our age with its restlessness and complexity of life is especially dangerous to mental health. It is very doubtful whether this is true. The impression that the number of mental disturbances is rapidly growing is certainly to a high degree the result of fuller medical knowledge by which much is recognized as disease which in earlier years appeared only as a defect of character or of temperament or of intelligence within the limits of health. Many forms of mental disorder like the psychical epidemics of medieval times have disappeared. Moreover we have no right to forget that the extreme complexity of our modern life with its tremendous technical development has changed the rhythm of the events, but reduces to a high degree the demands on the individual mind. The technic makes the functions of the individual simpler and more comfortable. The amount of psychophysical energy required for the needs of the day is decreased and not increased by railway and telephone and automobile and rotary printing press. The flickering light of the past must have irritated the nerves where gas or electric light makes seeing easy.

Yet while the external conditions may be wrongly accused of being sources of the widespread nervousness, it is perhaps more justifiable to say that our time is in many of its features tending more than the past toward an *unsound inner attitude* of man. Much of the present civilization leads the average man and woman to a superficiality and inner hastiness which undermine sound mental life more than the external factors. We eulogize the educational principle of following the path of the true interest and too often mean by that the path of least resistance. The child learns many useful things, but not the most important: to do his duty and to do it accurately and with submission to an unselfish purpose. Hence the energy to concentrate on what is not interesting by its own appeal

remains undeveloped. The result is an abundance of hasty judgments, of superficial emotions, of trivial problems, of sensational excitements, of vulgar pleasures, all of which result in a disorganization of the brain energies. A sound mind is a well-organized mind in which a controlling idea is able to inhibit the opposites and is in no danger of being overwhelmed by any chance intrusion. The discipline and training of youth to concentrated attention and the checking of everything hysterical in social life are the essential demands, if mental deterioration is to be prevented.

In its positive form the psychotechnical advice will help toward the development of sound social habits. The tendencies toward cleanliness, toward regular organization of the daily life, toward play and sport in the open air, toward frugality in the meals, toward temperance in the use of alcohol, coffee, tea and tobacco, toward discipline in sexual life, toward reasonable prudence in the face of danger, are mental attitudes and dispositions upon which the health of the community is dependent and which must be systematically fostered. It is a mistake to believe that such social efforts can be really successful, if they are left to common sense views: they must be based on careful psychotechnical calculations founded on a thorough insight into the mental mechanisms of the average man and woman.

CHAPTER XXXIII

CULTURAL PSYCHOLOGY

The Outlying Fields of Psychotechnics.—Psychotechnical sciences are needed wherever mankind stands before purposes of civilization which are related to mental life. We have discussed four such purposes, the securing of education, justice, economic progress, and health. It is evident that they do not constitute the totality of aims toward which the social consciousness is directed. We confined our discussion to these four fundamental groups, because the psychotechnical work there has been relatively best developed. But it is evident that many other significant purposes of civilization suggest similar psychotechnical efforts. Politics and social reform, morality and religion, art and science depend upon mental functions as much as education, law, industry and medicine. Moreover everyone of these great aims branches out in many directions. The economic progress might be served by psychotechnical aid to agriculture or to mining as well as to manufacture and commerce; and few branches of the economic life are more significant and more accessible to psychology than home economics and domestic activities of every kind. We may have a psychotechnics of navigation and of transportation, or to point in quite different directions a psychotechnics of social intercourse and of sport, or again, a psychotechnics of war, with its abundance of problems.

The whole social organism from the simplest intercourse of man with man to the most complex coöperation of man-

kind may profit from the systematic application of psychological methods and psychological laws. Every great social problem which agitates the public mind can be discussed on its highest level only when the mental factors involved are not treated from the standpoint of a hasty and superficial popular psychology, but from that of scientific study. Woman's suffrage and feministic movements, temperance and prohibition, capitalism and socialism cannot be really understood until the psychological differences between men and women or the psychological effects of alcohol or the psychological conditions for human satisfaction from wealth are studied with impartial, scientific earnestness. And this demand is felt not only for the momentous questions but for a thousand little problems which interest the community. It is superficial to speak in favor of or against simplified spelling as long as the mental processes involved have not been thoroughly analyzed. The trivial concerns of daily life with its caprices and fashions and the highest ideals of spiritual life with its strong appeals can both alike be furthered by psychotechnical principles.

Even the inspiration of the church is in no conflict with a calculating study of the psychological effect which, for instance, the colors of the church windows must have on the emotional setting of the worshiper. The moral life does not suffer, if conscious efforts are made by suggestion and upbuilding of habits and removal of temptation to keep the weak one on the straight path. Of course it is true of the social and moral and political interests as well as of all the others which we have discussed that the psychologist can supply only the facts. He can say only that if a certain mental end is to be reached a certain means must be employed; but it is never the share of the psychologist to decide what ends ought to be chosen. We must still trace the chief psychotechnical lines at least for two groups of purposes: the aims of art and science.

Life Enjoyment.—From a philosophical point of view we must insist on a sharp demarcation line between beauty and pleasure, between the ideal aims of a drama or a symphony and the mere selfish aims of a pleasant meal. From a strictly psychological point of view, however, art and literature and music are not separated by any sharp boundary from many other endeavors to bring joy to the human heart and pleasure to the human senses. The psychotechnical work must be adjusted to the psychological aspect. If we wish to use psychological knowledge for purposes of art and beauty, the outlook must be widened so as to include the whole field of human enjoyments, the pleasures of life as well as the pleasures of art, the psychotechnics of the agreeable as well as the psychotechnics of the perfect.

Thus we may begin to apply psychology to esthetic problems in the midst of the most trivial interests. The psychologists may well give advice to the florist who wants to increase the fragrance of his bunch of flowers by combining contrasting odors. His experimental studies on taste and temperature and smell and touch could contribute much information useful to the cook who is anxious to prepare savory dishes. He has not a little in store for the dressmaker who tries to produce pleasing effects by combinations of colors and forms and materials. But even this apparently insignificant part of psychotechnical interests can often be linked with problems of deep import. The question of the psychological conditions for enjoyment may be recognized as one of great social consequence, if we inquire by what attractions the workingman can be drawn away from the saloon. By what wholesome appeals to the desire for amusement can the masses be diverted from the unhealthy influence of the motion pictures which too often make crime and vice seductive and create a hysteric attitude by their thrills and horrors?

In this sphere of life enjoyment can also be found

every possible form of play. The practical interest of the psychologist finds numberless problems in the games of the adult as well as in the play of the nursery. The strictly esthetic effort is to shape the play so that it gives the maximum of pleasure. The psychology of emotion, of imitation, of suggestion, of association of ideas, can contribute much to secure this effect. The toys and games of the child must be adapted to his youthful imagination, to his desire for make-believe, and to the shifting character of his attention. The ball games and the card games can be steadily improved by an insight into the mental demands. But this direct aiming toward pleasure is certainly not the only psychological consideration. The psychologist cannot overlook the mental effects which the play and the game may have in the development and training of the young mind. Play is to him to a large degree a preparation for the functions of life.

Again if the play is accepted as valuable, the psychologist must ask how it can best be learned. We have interesting experimental studies on the methods of learning to play chess or ball. Finally, the game may suggest psychological problems accessible to experimental investigations which have nothing to do directly with the pleasure derived from the game, but refer to the psychological conditions of effective play. The football players may be psychologically examined; their reaction time may be measured in thousandths of a second in order to determine the individual differences and to study the changes in their rapidity of response under different conditions. Yet, after all, the psychological interest centers in the higher esthetic emotions. We must turn to the psychotechnics of art.

The Fine Arts.—The esthetic part of experimental psychology seems especially predestined to be applied in practical life because no group of experimental investigations in the psychological laboratory can be so immediately transformed into advice for the outside world. The ex-

periments with feelings and emotions are usually far removed from our actual life interests. But when it comes to esthetic emotions the walls of the laboratory are no barrier. The reason for this difference is evident. All the practical emotions presuppose our belief in the reality of the objects. We cannot become really joyful or sad over something which we recognize as fictitious and introduced for experiment's sake. But the esthetic emotion has no reference to our practical demands. We do not enter into a personal relation with the characters of a novel or a drama; we are disinterested spectators of the life which is exhibited in art. The result is that the esthetic emotion can be created with all its richness in any corner of the laboratory. A Japanese print or a sonnet can arouse exactly the same feelings there which it would create in the museum or at the fireside.

Yet while the conditions for the growth of esthetic psychology in the laboratory are favorable the development has been on the whole a slight one, and very few of the results have been brought into actual contact with art. The work started half a century ago with simple experiments in the choice of visual forms. The observers had to select among many rectangles those in which the relation of the short side to the long appeared to them the most pleasant, or among many divided lines those in which the division seemed to them most pleasing. It is clear that the psychotechnical application needs no further argument. If for instance it is found that a rectangle appears most pleasing when the relation of the "golden section" prevails, that is, when the shorter side is related to the longer as the longer to the sum of both, the artist ought to prefer this proportion unless some special reasons suggest a deviation. We may at least trace some groups of problems which have been studied since those early days.

In the field of visual arts much interest was given to the pleasantness and unpleasantness of isolated and com-

bined *colors*. The pure color is always more agreeable than the slightly saturated, but some colors, especially green and violet, can reach the highest degree of pleasantness with the middle stage of saturation. On a dark background the order of pleasantness seems to be red, yellow, green, blue; on a light background, blue, red, green, yellow. In combinations the most pleasant effects come from colors which are slightly less different than the complementary colors. Colors of the red side of the spectrum enter more easily into pleasant combinations than those of the blue side. Yellow is most favorable; the golden frame for pictures therefore most advisable. Other investigations dealt with the apparent weight of the colors. In arts and crafts, in painting, in architecture, we demand stability and heaviness at one place, lightness and freedom at others. An experimental analysis of these associative elements in colors can aid the artist in his conscious selection.

Very important for the painting are the studies which refer to the associative element in our seeing of saturation. We are accustomed to keep in memory those colors of the well-known objects in our surroundings which they usually show under average light conditions. We believe, therefore, that we really perceive their color in full saturation, even when by lights or shadows the pure color character has been lost. The result is that we demand from paintings a degree of saturation in the colored objects which greatly surpasses the actual colored lights in life. If the painter wants to produce a pure impression of reality, he must adjust himself to this psychological tendency of the spectator and must exaggerate the saturation.

In the world of *forms* the elementary laboratory experiments have come nearest to actual problems of art in studies on repetition, on symmetry, on unity, and so on. The aim is here as in experimental work everywhere to

abstract from the manifoldness of things and to reduce the situation to the simplest terms. When, for instance, the esthetics of *repetition* was studied in the laboratory, fifty movable white silk threads were stretched over black velvet parallel to one another so that any group of combinations could be made. It was found that no real pleasure results when instead of one or two units three different units alternate, such as groups of two, three and five threads. If two groups alternate, the pleasure is the stronger, the greater the difference of interest. One is always perceived as the chief and the other as the secondary group. In the chief group far-reaching variations may occur without interfering with the pleasure, but if the secondary group is not exactly repeated, the enjoyment quickly decreases. The magnitude of the units is more important than their quality. The experiments with such simple threads in various group combinations admitted a large number of such deductions, and it was at the same time possible to demonstrate the actual realization of these principles in works of architecture, where windows and columns, statues and arches alternate.

The investigation of *symmetry* can start from the evident fact that a geometrical symmetry on the two sides of a vertical middle line is satisfactory. The question is how far this same pleasure in balance can be secured by geometrically unequal forms. If there is a short vertical line on the left side at a certain distance from the central line, how far from the middle line must a long vertical line on the right side be, or a double line, or a star, or a perspective drawing which suggests depth, or a colored object? What is their effect on our feeling of equilibrium, and where must they be placed in order to give the most satisfactory esthetic impression? The experiment shows that it makes a difference whether there is a frame around the whole field or not. If it is an unlimited field, the weight of the forms increases with the

distance from the center. The small line far out, accordingly, balances the long or heavy line near the center. It works like a mechanical principle of balance. But if a frame surrounds the whole, the psychological effect is different. The frame reflects the attention toward the center and everything appears the stronger and the more impressive, the nearer it is to the center. The short vertical line near the middle, then balances the long line near the frame. Hence the composition of an unlimited arabesque must be different from that of a framed painting, and the artist can translate the experimental results into practical standards.

Other groups of experiments do not point directly to the conditions of pleasure but rather to the technical factors from which the work of art is built up. If the artist wishes to paint the glowing effect of the sinking sun, he may make use of the psychology of contrast effects and after-images and may paint little green zigzag lines in the purple disk. Or if he wishes to bring out the impressionistic, glittering effect of a sunlit summer landscape, he may make use of the modern technic of small color spots placed side by side. But then the psychologist can aid him in determining the size the spots should be, if color fusion and mixture are to be avoided and the gleaming restlessness is to be suggested. Or the technical question may stand on a higher level. We know that an essential condition of esthetic enjoyment is the apprehension of unity in the work of art. We may study experimentally what conditions favor the uniting of the impressions. It can be shown that if many circles occur in the field of vision, they are easily bound together by the imagination, triangular forms less easily, squares still less. Spots of the same color have this tendency toward unity still more than equal forms. Especially for arts and crafts such experimental results can be practically important.

While researches of this kind deal with the works of

art themselves, others refer to the *mental states of the spectator*. Both the individual differences and the general conditions of esthetic enjoyment may be analyzed. What is the influence of different types of imagery, of difference in age, of different degrees of education on the appreciation of a picture? What is the effect of repetition, of fatigue, or emotion? How are the esthetic impressions influenced by tea or coffee or alcohol? How are they dependent upon the position of the onlooker? The experiment shows that the same pictures may have characteristically different effects when they hang above or below or at the height of the spectator's eyes. How does the alternation of feelings influence the individual? Experiments have been carried on in which in a dark room beautiful landscape pictures and repulsive views of surgical operations alternated with increasing rapidity. As soon as a high speed is reached, the effects are different with different types of persons. With some the contrasting feelings inhibit each other, with some a new complex feeling arises from the change of the impressions, with some the one wins over the other and with some a mutual reinforcement by contrast seems to result.

Music and Poetry.—We have touched on a variety of esthetic experiments in the field of visual impressions. Their psychotechnical importance refers equally to painting, sculpture, architecture and industrial arts. The problems which link themselves with poetry and music could be grouped in a similar way. The psychologist proceeds here too from the esthetic elements, from the pleasure value of the tones and chords and of simple rhythms. An abundance of work has cleared this ground. The psychology of the melody, of the rhyme, of the formation of stanzas, of the associative factor in music, of the various musical instruments, of the dramatic interplay and contrast, and of the stage setting is still little analyzed by experimental methods.

To give an illustration of a more complex experimental research in the field of poetry, we may consider recent studies on the psychophysical effect of the speech elements in verse. For a large number of English poets exact statistics were gathered concerning the relative frequency of every vowel and consonant sound in accented and unaccented syllables. It was found that every poet has his own characteristic percentage of frequency for the various speech elements. The most frequent sounds were then used for the formation of nonsense syllables and these were grouped as five-iambic lines. The subjects while reading these lines aloud registered their subjective reactions, their inner tensions and relaxations by rhythmical hand movements which were recorded on a revolving drum. It was found that the differences of the reactions to these nonsense syllables corresponded to the differences of the reaction movements to the real verses of the poets. The differences between the psychophysical responses to Byron and to Keats were similar to those between the responses to the meaningless letter groups, although the subjects did not know from what poet the most frequent letters had been drawn.

It would be onesided, however, to demand that every psychotechnical prescription in the realm of beauty be drawn from experiment. Other analytic methods must supplement the laboratory work. Statistics may furnish the material. It has been found that the number of unaccented syllables that stand between accented ones in standard prose change with the various literary intentions. They are more frequent in narration than in dialogue. Or it has been observed that the monosyllabic words are much more frequent in the drama than in the novel, more numerous in an emotional than in an indifferent text. Similar studies are reported from the field of music. The time value of the accented and of the unaccented syllables differ much more in the artificially composed songs

than in the folk songs, and the pitch of the tones for the accented syllables is on the average higher than that for the unaccented. A writer or a composer may draw suggestions from such statistical inquiries. If the composer wants to produce by his melody a kind of folk song effect, he may give his attention to the distribution of time values in the various syllables.

Of course, it would be an absurd misunderstanding, if the psychologist's advice were looked on as a substitute for true artistic inspiration. But every art needs many forms of technic. The sculptor must know how to carve the stone and the musician must have studied counterpoint. The mere knowledge of counterpoint is not sufficient for composing music. The psychotechnical prescription too can never replace the imagination and originality of the artist or poet. But an acquired knowledge of the psychotechnical rules can be an aid to him, which may become as subordinated to his creative energies as the mere technic of color mixing is subservient to the intentions of the painter.

The Work of the Scientist.—Our last word may be devoted to the field of science and scholarship. But here we must be on the lookout. Certainly we can apply psychology in the interest of knowledge, inasmuch as we use psychological laws for the explanation of the historic events. But we have discussed fully the difference between this kind of application and that of psychotechnics. We saw that the psychohistorical sciences which explain the political and religious, artistic and economic history of mankind by psychological laws are fully justified, but must be sharply separated from the psychotechnical efforts which never are turned backward but are directed toward practical results. Our question here can be only whether it is possible to make psychotechnical use of psychology in order to aid the practical work of securing scientific truth. If, for instance, a natural scientist makes an observation

and the psychologist can show that under the given conditions certain sources of error are inevitable as they spring from the process of perceiving, the psychotechnical application is evident. The scientist is forced to give his attention to these psychotechnical conditions of perception. No doubt, the psychohistorical and the psychotechnical interests are often intertwined. Our last glance must fall on these strictly psychotechnical problems.

We may begin with the natural sciences. The student of nature must know first what constant psychical factors influence his work, and he must furthermore know how far variations from individual to individual may be expected. Certain overestimations or underestimations of space and time are characteristic of every consciousness. The effects of color contrast or of adaptation of vision or the rhythmical apperception of equal sounds and numberless other conditions of perception may also be taken into account as constant factors. On the other hand the naturalist cannot predict in general how much a special astronomer will shift the optical impression of the passing of the star in relation to a series of pendulum sounds. That depends upon individual differences which must be examined in the particular case so as to free the telescopic observation from mistakes. The complex traits of suggestibility, of memory, of training, of attention, must be determined among the individual differences. Moreover the same observer may come to very different results in the morning or in the evening, in a state of freshness or of fatigue, at the first or at the repeated observation, or under different climatic conditions. It is the aim of psychotechnics not to predict how the individual will behave, but to emphasize that this individual behavior must be examined if the results are to be trustworthy.

The detailed psychological investigation must be adjusted to the needs of the special science. We may point again to the psychotechnical interest in *astronomy*. It is

well known how much astronomers disagreed on the delicate lines, the "canals," in the planet Mars of which up to four hundred have been drawn by some observers. A leading astronomer raised the question of how far we are really able to watch such faint lines under the given conditions of illumination and how far they are the products of imagination and suggestion. He therefore started psychological experiments with thin artificial lines drawn on a translucent disk at ten meters distance from the observer. He examined how far blanks in the lines and interruptions could be noticed and how far additional lines were imagined when the artificial disk was seen at the angle at which Mars is observed in the telescope. It became evident that most of the apparent lines must be illusions.

Another interesting psychological condition of astronomical research is the tendency to overestimate or underestimate the differences of intensity. The astronomer is accustomed to estimate a star's magnitude by its relative place between two chief classes. A highly trained ability for this estimation is especially important for the study of stars which are of changing light intensity. The psychological analysis has shown that this ability of the astronomers fluctuates. The beginner makes the steps too large, the well-trained observer tends to make them too small. But there are periods in which this sensitiveness steadily increases, and then suddenly falls below the average. A subtle psychological examination is needed to estimate the correctness of the individual judgment. Here we may also think of the reaction times, important for the time observation of the astronomer. Another much discussed astronomical phenomenon of psychological origin is the increase of size not only of sun and moon but also of the star distances near the horizon.

The illusions of space and time estimation, the wrong judgments of movements, of angles, of color qualities and

color intensities, of noises, of tastes and smells, of resistance and weight are important for the *physicist and chemist*. They must give fullest attention to the threshold for stimuli and their differences, to the limits of increase for sensations, to the effects of contrast, to the after-effects, to the phenomena of mixture and fusion, to the results of fatigue and of training. The psychologist knows that the same object may appear different in weight when it is hot or cold and that objects of equal weight may appear heavy or light according to their size. The physicist must know such illusions, and while he can objectively eliminate them by his scales, there is no natural science which does not ultimately rely on the senses. The chemist too, in spite of all his technical devices, is dependent upon the sense impressions. He relies on his color and smell sensations, and frequently even on his temperature and tactual sensations. It would be psychotechnically very important to know the individual differences in the sensitiveness of the chemists when the perceptions of colors, light intensities, opaqueness, tastes and smells are reported.

The psychophysiological influences on perception, judgment, attention and memory are still more important in the field of the *descriptive sciences* in which the exact measurement must often be replaced by simple impressions. The observations of the mineralogist and geologist, of the botanist, zoölogist and anthropologist, of the physiologist and clinician, are frequently based on his personal impressions of forms and distance, of colors and brightness, of taste, smell and noise, of time intervals and numbers and especially of similarities. In everyone of these directions both constant conditions of illusion and error and individual variations and fluctuations must be psychologically considered. The explorer who estimates the height of a distant mountain must know what an extremely complicated psychical achievement is involved.

A mental function the importance of which can hardly be overrated for the work of the scientist is his suggestibility. Every scholar is under the influence of suggestions in the form of prejudices or school doctrines. Our time has witnessed the belief of the French physicists in the N-rays. They were first observed in consequence of a chance optical illusion. No one outside of France could discover them, but through the influence of suggestion every later observer in France saw them, until their illusory character was recognized. The most fertile soil for suggestive influence is, of course, the so-called scientific studies of physical phenomena alleged to be of supernatural origin. The materializations of the spiritualistic mediums and similar trance phenomena would never have deceived the observers, if the uncanny conditions of the "séances" were not so favorable for an abnormal suggestibility.

The different inclination of the observers to be impressed by likeness or by unlikeness also demands careful psychological testing with the help of the experiment. Some scientists are more impressed by similarities and others by differences. The natural scientist has to form judgments of this kind so frequently that his tendency ought to be measured by exact standards. Finally the experiments have shown that the ability for the forming of judgment, for estimating, and for describing can be increased by training.

The Work of the Historian and of the Philologist.—The scholar who seeks truth in the field of civilization, the historian or the philologist, needs the psychotechnics of scholarship no less than the student of nature. We have excluded from the realm of psychotechnics the mere psychological explanation of historic events, but we surely must include the psychological analysis of the sources from which the historian draws his material. He must treat his authorities from the old chroniclers to the latest war

correspondent as the lawyer treats the witnesses. He must study the psychological conditions of their perception and apperception, their attention and memory, their temperament and character. The judgments of time intervals or dimensions, for instance in a battle, depend first upon illusions of perception which are common to all; but the frequent exaggerations are still more often the results of individual emotions. Hope or fear, enthusiasm or hostility, changes all figures.

Moreover observations are always influenced by the tendency to shape the new in accordance with the accustomed; and expectation too falsifies the experience. Finally the reporting observer is a member of a multitude. He may be under the influence of crowd suggestion. Partisanship and indignation, national ambitions and national vanities, fashions of the day, may have dictated his story. The experiment shows that every emotion interferes with the attention. Mere surprise may have paralyzed the ability for objective observation. All the researches which have been carried on in the interest of legal psychology can be applied here for the analysis of the historic testimony. An interesting complex case is that of the autobiographies. The facts are likely to be distorted not by a mere fading away of memories with the passing of time, but characteristic fusions and substitutions, exaggerations and reductions, concentrations and eliminations, must arise from psychological causes.

Here also we need the help of group psychology. The historian must know how the observations of women are likely to be different from those of men, how various vocational groups or professional classes are likely to create different reports. The medieval chronicle is different according to whether the scribe was young or old, a monk or a knight. But the mental types of the writers are no less significant. The historian must have a psychological understanding for the different intellectual types, for the

objective and the subjective minds, the attentive and the superficial observers, the men with visual or with acoustical imagery. The prevalence of one or another group of sensations can often be traced in historical descriptions.

Even the historically important formation of rumors has been brought into the scheme of the psychological experiment. The results showed a typical process of remoulding of the original material. The psychotechnical historical studies must also include the laboratory experiments on misreading, mishearing and miswriting. The historical sources are products of mental mechanisms which often create defective work. The author did not write what he intended to say, or the writers of the old manuscripts did not understand correctly what was dictated to them. Even typists and typesetters make mistakes. Work in the psychological laboratories has made it clear that the overwhelming majority of these mistakes are not accidental, but are the results of associated ideas, especially ideas with strong emotional interest. The suppressed idea may discharge itself in action as soon as the similar idea occurs in consciousness. The mistakes throw light on the mind of the writer, but on the other hand the historian must reflect on the psychological conditions of the writer in order to eliminate his mistakes and to correct, for instance, the wrong names and dates in his story.

This leads us to the value of psychology for the *philologist* for whom the written text is the direct object of interest. Careful experiments have traced the conditions by which mistakes slip into the rewriting and copying of text. The influence of acoustical and optical anticipations and after-effects were determined. The experiments showed, moreover, that the copying of meaningless texts occasions entirely different mistakes from those which occur in the copying of a text which is understood. In the latter case, for instance, words are left out only when they have no significance for the meaning of the sentence. Hence it is

to a certain degree possible in comparing the various philological manuscripts to determine whether the writer did or did not understand the text and this allows a judgment concerning the character and importance of the substitutions and changes in the text. Another aspect of philological criticism is emphasized by the psychological studies on speech melody. It was possible to show that every individual author has a certain system of rising and falling movements in the intonation of his sentences. This and similar formal traits of style remain so constant with the special writer that as soon as his psychological tendency is recognized it becomes possible to discover what parts of an epic poem or of a prose book are spurious and are later interpolations.

The Work of the Psychologist.—We may take our last step and ask whether even the work of the scholarly psychologist may not be aided by psychotechnical knowledge. We have seen that the science of causal psychology stands or falls with the possibility of selfobservation. Whoever treats it simply as a science of external behavior does not need selfobservation, but he gives up the ideal of psychology and makes the so-called psychology a mere branch of physiology. For his work the psychotechnics of natural science would be sufficient. But those who acknowledge that the psychologist has to describe and to explain the experiences in so far as they exist for the individual as such, must seriously consider the character of *selfobservation*. The psychologist is himself a witness, and the analysis of his ability to be a witness is the more important as he has to give testimony about facts which no one but he himself can experience. The question must therefore arise how far he is predisposed to give a reliable account.

The psychologist's mere will to observe may have too much disturbed the processes in his consciousness. His suggestibility may have made him believe that he experi-

enced memory ideas or feelings which did not occur. He may have imagined he experienced certain feelings because he expected their appearance. He may be unable to disentangle the complex experiences, because he lacks training in the recognition of the elements. The results of selfobservation must be freed from psychical sources of illusions and mistakes, just as much as the observations of the astronomer. But that is indeed ultimately a psychotechnical interest. The investigator in the psychological laboratory must train himself systematically in the introspective methods and this training must be controlled by psychotechnical knowledge.

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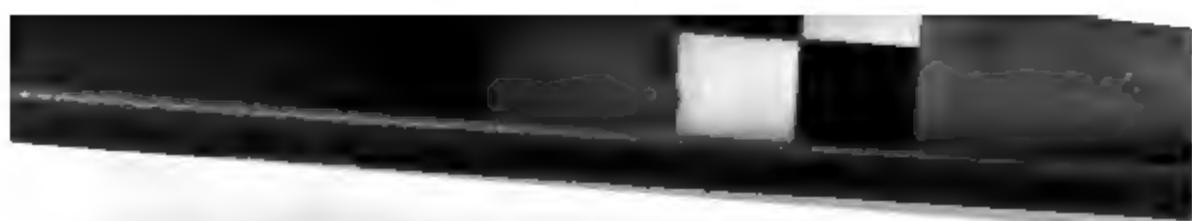
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